In This Issue — Protection Illumination by Means of Projectors

JOURNAL OF ELECTRICITY

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Assembled on the call of the Chamber of Commerce of the United States and representing more than half a million business men and every industry in every State in the Union, this convention promises to our people that business will do all in its power to prevent waste of men and material and will dedicate to the nation every facility it has developed and every financial resource it commands, on such terms, and under such circumstances, as our Government shall determine to be just.

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HOW THE WEST IS HELPING TO WIN THE WAR—IV

THOUSANDS upon thousands of people viewed with outspoken admiration the beauties of the Panama-Pacific Exposition which competent critics depict as having chronicled the greatest single advance in illuminative effects that the world has ever seen. Little did these visitors dream at that time that these same wonders in scenic effect by night would within two short years be a means for protecting the industrial activities of a hundred million people. Once again has an engineering triumph in the West added its quota toward bringing to a successful conclusion the greatest crisis of all history.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

VOLUME XXXIX SAN FRANCISCO, DECEMBER 15, 1917 NUMBER 12

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Merry Christmas

That "good will toward men" has now become the slogan of a great nation, from the one who sits in the loftiest chair of authority down to the lowliest one of its hundred million human souls, is indeed the sweetest message which has come to this sorrow torn world since the Shepherds' song of nineteen hundred years ago: "Peace on earth." As men of the electrical industry, we rejoice at this season of the year, for equipped with the subtle force electricity, almost akin to the Divine nature itself, we go forth in the godlike determination to see to it that all men and all nations shall know and honor the voice of the people and the world at last be free. In such a spirit, then, can not we greet each other at this season of the year with a feeling never experienced before, when we say on Dec. 25, 1917: "On earth peace, good will toward men."

The West Comes into Its Own

The immediate further development of the vast water powers of the West would contribute conspicuously to the three most necessary economic forces for the successful prosecution of the war — by the saving of labor, the stimulation of industry, and the conservation of natural resources.

That California is monthly being called upon to supply such enormous quantities of fuel oil—even twenty-five per cent of the world's output—to such an extent that its storage supply is being depleted over the actual production at the rate of twelve million barrels annually is now a matter of public knowledge. This fact was brought out by the California Railroad Commission before a recent gathering of electrical men in this commonwealth.

In the East the enormous demand for coal production is taxing the railroads to the limit. Again, this abnormal demand is diverting labor to assist in the mining of this product and on the other hand the possible depletion of the more easily accessible fields of this great national resource is not to be overlooked.

Naturally, then, the public mind turns with hope of relief to the great West, blessed with millions of possible horsepower in water power development.

In recent years, the hydroelectric utilities of the West have demonstrated, under public regulation, an ability to develop hydroelectric energy and to successfully market this product at such reasonable rates as to satisfy completely the public conscience in the advisability of rational development under private operation.

To develop at once the vast water powers of the West that are necessary for the conservation of fuel, the progress of industry and the stabilizing of labor, will require enormous outlays of money. Already the President of the United States is considering the advisability of the national government's loaning a billion dollars to assist the railroads in the present emergency. Coming now to the water power situation, it is clearly evident that a rational policy of loans from the national government to assist immediate development of the water powers of the West would utilize the powers of our streams and divert them where their energies could stimulate our industries and not, as is now the case allow their waters to flow thriftlessly and aimlessly from the mountains to the sea.

This financing might be accomplished through the ordinary banking channels, if the Federal Reserve Banks were in a position to endorse such loans as war time measures after due investigation and approval by the utilities commissions of the respective states.

The immediate need of governmental loans of this nature is keenly felt in the West. Take the case of but one instance as an example. In the watersheds of the San Joaquin and Kern rivers alone are located sufficient power, so competent engineers report, to develop energy to conserve the twelve million barrels of oil that are now being depleted annually from storage supply in California. Granted that it would take a hundred and twenty-five millions of dollars to properly develop this power, it takes no imagination

of extraordinary power to see that a brief ten years' saving in oil by means of such a development as this would conserve forever a lasting and necessary industrial activity that neither time nor the ravages of war could take from posterity.

It is to be hoped that the authorities having the matter in charge will take early favorable action for legislation looking toward governmental financial assistance in such developments.

A Notable Advance in Merchandising

From time to time, those who are engaged in the electrical business have given more or less expression to the necessity of closer co-operation between the various branches of the electrical industry. Due credit should be given to the central stations of the West, and particularly to their strong organization, the Pacific Coast Section of the National Electric Light Association, who have since their meeting held at Riverside, in April of this year, succeeded in bringing the lighting and power industries, electrical manufacturers, jobbers, contractors and dealers closer together.

It was through the broad view taken by the officials of the central stations of the Pacific Coast Section of the National Electric Light Association that made it possible for members of the various branches of the industry to sit together on the various committees, in order that they might exchange ideas—discuss the different problems that would lead to closer co-operation and a better understanding of the responsibilities each branch of the industry owed to the other. As an outgrowth of this general co-operative movement, the Commercial Committee of this organization has submitted a plan to the Executive Committee which has been approved, as set forth on page 574 of this issue.

It is the intent that the work outlined should cover a period of one year, starting January 1, 1918, ending December 31, 1918.

A great deal of responsibility in the success of the campaign will fall upon the committee appointed, which represents the various branches of the industry, and without the support of all of the various branches, it will be impossible for this committee to carry on this work successfully.

With the assurance of the undivided support of the central stations, it is sincerely hoped that all those engaged in the other branches of the electrical industry will seriously get behind the movement and do their part to successfully carry out the contemplated plan.

Each branch of the industry is affected just as much as that of the other, and the proportion of benefit each receives will be dependent upon the amount of effort put forth individually in supporting and carrying out the suggestions offered by the committee—whether they be right or wrong—that in the end after a fair trial all may be convinced of the sincerity of purpose and desire of all interests to do their bit and that unselfishly.

If there have been any misunderstandings between the various branches of the industry in the past, it is hoped such will not stand in the way of progress, and that all may start anew, and thereby convince those similarly interested in other parts of the country, of the aggressiveness of the electrical interests in California and the continuous advancement of the co-operative idea in the West.

Inductive Interference Investigation

A beautiful piece of scientific work has recently been completed in the West that will at once attract nation-wide attention. The advent of the harnessing of water powers in mountainous districts of this section and the transmission of these energies to industrial centers often hundreds of miles distant early developed inductive interference with telephone circuits to such an extent that the solution of this problem became one of the first magnitude.

In 1912, under the auspices of the California Railroad Commission a joint committee on inductive interference was appointed, composed of engineers from all parties to the issue. Perhaps no other problem involving such severe mathematical analysis as this has ever arisen for solution and been so successfully handled.

For five years the investigation has been under way and is now brought to a successful conclusion.

Some idea of the magnitude of this work may be gathered from the fact that the technical report of the committee comprises among other matter over two hundred curve sheets, setting forth some three thousand curves.

The publication of all of these data is contingent upon the receipt of a sufficient number of orders substantially to defray the cost of printing and binding. All persons who are interested in procuring a copy of this publication should communicate at once with the Chief Engineer of California Railroad Commission to this effect. This work is a monument that should be preserved for all posterity and its contents should be widely disseminated.

On another page of this issue, an extensive resume of the work is set forth. This resume has been drawn for the columns of the Journal of Electricity by the Joint Committee on Inductive Interference.

The entire work constitutes a notable example of the efficiency of co-operative work of engineers, representing conflicting interests, in lieu of methods of litigation based upon meager information concerning the underlying principles and facts of a complex problem.

Aside from the highly practical value of the work contained in this splendid treatise, the silent message it carries of the good to be accomplished under the spirit of co-operative helpfulness is perhaps even the most striking of all.

Flood Light Projectors in Industrial Protection

The rapid rise in the use of the flood light projector in the protection of industrial plants has indeed been marvelous.

Historically speaking the parabolic reflector is interesting. As far back as 1763 the Mersey lighthouses of England, under the direction of Dockmaster Hutchinson at Liverpool, used parabolic reflectors consisting of small facets of silvered glass set in plaster of paris. Spherical metallic reflectors were

introduced in France in 1781, followed by parabolic reflectors on silvered copper in 1790 in England and France, and in Scotland in 1803.

It was not, however, until the great Panama-Pacific International Exposition in 1915 that the world as a whole was introduced to the wonderful scenic effects of flood lighting at night by the use of reflectors. While the tantalizing beauty of this great exposition, brought about largely by means of electric flood lighting, will ever remain in the minds of those who beheld it, as a picture of exquisite charm, still it was not until the exigencies of the great world war brought on the necessity of industrial plant protection that the flood light projector has come into its own as a real and necessary adjunct to modern commercial and industrial life.

Throughout the nation much thought and study has in recent months been given to the protection of manufacturing establishments and power generating stations. Especially has this been true in the West in places where a well placed bomb might destroy a dam or an hydroelectric installation that might take years to replace.

It is interesting to note the method employed in flood lighting by night. In the larger industrial centers it is usual to light up not only the premises and its approaches but especially the buildings themselves often are lighted to a high state of illumination. In the protection of hydroelectric plants, however, there has been evolved in the West a different method that it is believed is more efficient for the purposes in view.

Thus at the great Longlake Plant of The Washington Water Power Company twenty-five miles west of Spokane the power house building itself is kept in total darkness while the cliffs and all approaches to the installation are kept well lighted. By means of this procedure the occupants and watchers in the power house are enabled to study all the surroundings without being observed themselves.

The entire problem of protective illumination is one of great importance at the present time and it is believed that the manufacturers of projectors, after careful study of the needs involved, are handling the supply of these articles to the trade in an able and efficient manner.

The Corporation School Idea

Electrical men are today facing a new world. Industrial conditions and methods have been revolutionized by the war and the pressing needs of the moment are continuing from day to day to force efficiency and labor saving and invention to meet the situation. It is going to be a more technically specialized world than ever after the war—and it is going to need more technically trained men to run it.

In the face of this situation, it is obvious to the men of the industry that the body of trained men is decreasing rather than increasing. Europe has suffered terrible losses from her ranks, losses that will to some extent be recruited from our corps. Vast numbers of our own men with years of service before them—men who were just beginning, in fact—have been drawn from among our trained workers to go to the front. Some of these will fail to return, others will drift into new lines of work. The number of college students enrolled in technical courses has been depleted at the same time by the call to the colors, so that the future supply of technical experts will not be adequate even to fill up the gaps in our present ranks, much less to swell the number.

Realizing this situation and foreseeing future need as clearly as we must, we can only set about such remedies as are at hand. In this connection, it is interesting to note the steady progress of the 'corporation school,' that department now so generally recognized in the industries, which offers specialized education for the corporation employees. It is a grammar school, a high school, a university as the needs of the particular group of workers demand. It is helping to educate the trained men to fill the vacancies—it is reaching the man who might otherwise not take the training in an outside school—it is giving him the particular training needed to fill the actual position.

This factor in our industrial development must be one of the important elements in increasing our efficiency, in making the industry of the United States a smoothly run, intelligently directed machine, not only to help win the war, but to meet the demands of competition after the war.

Many of the large electrical manufacturing companies, electric railways and telephone companies already possess such schools—all electrical enterprises which involve any number of employees should realize that the problems of their business can best be met by education.

The National Association of Corporation Schools as described on another page of this issue of the Journal of Electricity, is an organization made up by those who have such schools and of those who foresee them as a necessity of the future. Its purpose is the interchange of ideas and experiences, the discussion of such subjects as employment, vocational guidance, insurance plans—what to teach in your school, how to teach it. There is no antagonism between this and other educational agencies. It is working with the public school—in some cases public school teachers have actually come to the plants to conduct classes.

It is a movement in the right direction—too much cannot be said in encouragement of this work. Are you giving it your support by becoming a member, either under the name of your firm or individually?

THE NEW JOURNAL SERVICE: For the convenience of members of the various electrical societies of the West who may wish to refer back to the schedule of their meetings and for the particular use of strangers and travelers who might like to get in touch with the branch of their associations in the town they are visiting, the Journal of Electricity plans to run a directory of the electrical and associated organizations of the West beginning with the issue of Jan. 1, 1918. The officers of the society with their addresses, the time and place for regular meetings and the news of the current meeting are to be included in this directory. If you are the officer of any organization which should be included in this list and have not already been asked concerning your association, write out such information at once, care of The Service Department, Journal of Electricity, in order that it may be included in the first issue of the new year. Notice of change of meetings or election of officers should be promptly forwarded in order that members or visitors be not misdirected. As a Christmas Service in the promise of the new year the Journal of Electricity is particularly glad to be able thus to promote that generous hospitality for which the West is famous.

FLOOD LIGHTING FOR PROTECTION

(The protection of our industrial plants where materials are manufactured and of our great dams where power is stored to run the plants is quite as essential as any plan for the destruction of the submarine. One of the most interesting features of this war has been the adaptation of flood lighting to protective uses. From the Panama-Pacific Exposition where the possibilities of flood lighting were first fully recognized to the present war time situation, the West has taken a leading part.—The Editor.)

A typical long distance flood lighting projector

ANOTHER striking instance of the practical application of a purely æsthetic and scenic effect of illumination is forcing itself upon the industrial activities of the nation in a manner that once again demonstrates the wonders of electricity and its indispensable characteristics as an aid in solving the present national crisis. From the great Inland Empire in and about Spokane, Washington, where electricity drives the mining output of the Northwest down to the mammoth ship building yards along the waters that flow into the great Pacific, the flood light projector is rendering an invaluable service.

THE COLONNADE OF THE PALACE OF FINE ARTS

Note the detail with which this night scene is shown. Such feats in illumination as this made the Panama-Pacific Exposition world famous. In recent months these same ideas have developed a new nation-wide activity in the protection of industrial plants from prowlers by means of flood light projectors.

In war time it is vital that our industrial plants, railways, yards, bridges, power stations, and all means of supply and distribution be safeguarded. Adequate protection in the daytime is a comparatively easy problem but at night, when the dark hours afford cover for the prowler with intent to destroy, effective artificial lighting, to enable the guards to cover their territory efficiently is imperative.

THE HALSEY POWER HOUSE

Night view of an out-of-town hydraulic power station lighted with ten flood lighting projectors with 400-watt Mazda C lamps, located in two banks of five units each. Each bank is hidden in shrubbery 200 feet distant from the building and arranged so as to light a side and one end of the building. This particular plant can be seen for miles at night as well as by day from the Lincoln Highway and one of the transcontinental railroads.

In designing protection lighting, a few of the fundamental principles of illumination should be followed. Objects are seen by the light reflected from them to the eye and not by the light that comes from the light source directly to the eye. In designing protection lighting, therefore, two things should be kept in mind. As far as possible the light sources should be so placed as to throw the light upon the object to be seen and to enable the guards to stand in the unlighted area so that they are unseen by the approaching prowler. The guards should be protected as far as possible against glare from bright light sources. At the same time, the brighter the source in the field of vision of the approaching prowler, the more difficult it will be for him to carry out his plan.

Flood lighting projectors which consist of parabolic reflectors or a modification of parabolic reflectors properly mounted with concentrated filament Mazda C lamps will probably enable the best solution of the majority of protection lighting problems. Fig. 1 is typical of the flood lighting projectors now available. These can be obtained in a number of different types, some giving a high powered beam for long distance work while others spread the light out over a large

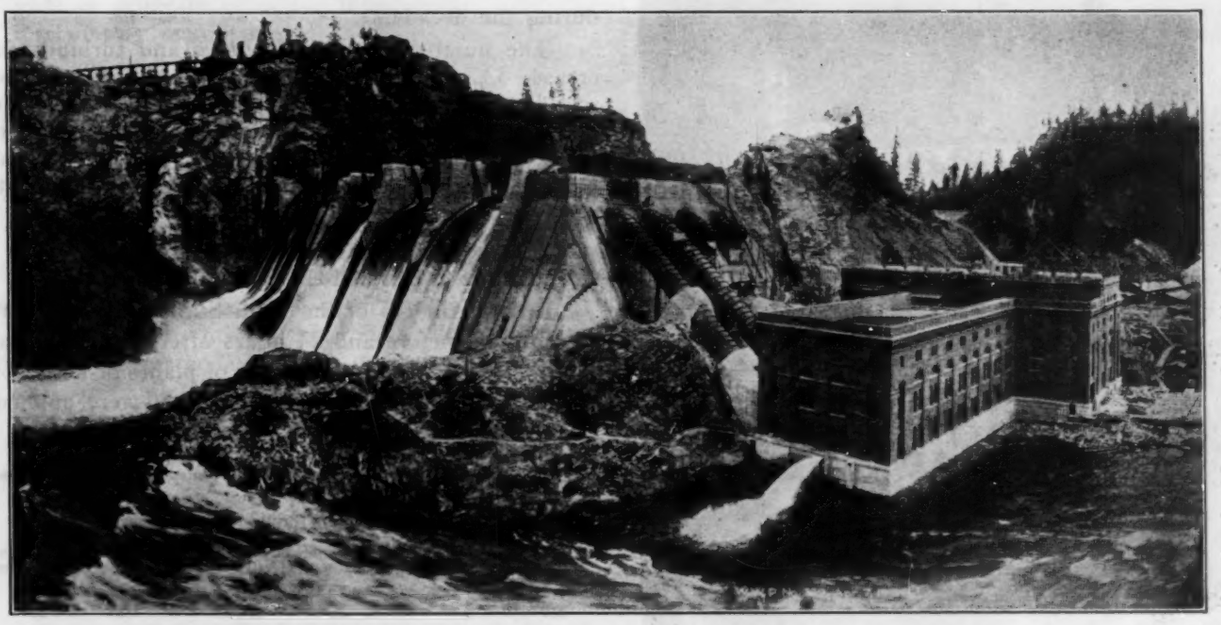
THE MARIN COUNTY SUBSTATION

Night view of the Pacific Gas & Electric Company's Marin County Substation, lighted by nine flood lighting projectors with 400-watt Mazda C lamps. They are placed in two banks, one of four units and the other of five units. Each bank lights up an end and one side. The one of four units is placed in the switching tower, 100 feet from the station and the one of five units is hidden in the bushes, 200 feet from the building. The effect of flood lighting a hillside is shown in these illustrations.

area. These units have the added advantage that they throw a cone of light comparatively high in power in one direction so that a guard standing back of them will be in shadow, unseen by any one approaching who will be blinded by the light.

A satisfactory method of lighting for large industrial plant which has a high fence around the building and grounds is to place high powered lighting projectors, equipped with 400-watt flood lighting Mazda C lamps, stationed about 300 feet apart and ten feet high along the top of the fence. This makes a ring of light around the plant. No one can pass through it without being seen. By placing these projectors so that all of the beams of light are pointed in one direction, there will be no annoying glare in the eyes of the patrols when they walk in the same direction the beams are pointed. Where the buildings are on the street line and no protecting fence is provided, the projectors may be placed on arms built out from the roof of the building, with the beams of light directed so as to strike the ground about 200 feet away.

Another effective way of applying these projectors is to mount the wide angle type on top of the buildings so that they throw their cone of light away from the buildings, thus illuminating a large area about the plant. By mounting the projectors in banks and fanning out the beams, an extremely effective and very economical installation can be made.



THE LONGLAKE PLANT OF THE WASHINGTON WATER POWER COMPANY

Here is a power plant that in its flood lighting protection features is establishing a unique and efficient record. This plant, which will ultimately have a capacity of 56,000 kw., is an important link in a chain of hydroelectric activity in the great Inland Empire in and around Spokane, Washington. Power from this system is used to supply the industrial activity of a district which produces over one-third of the entire lead output of the United States and a very large proportion of the zinc, two metals widely used in munitions manufacture. At night the power plant, efficiently mounted with guards, stands in total darkness, while the cliff and all avenues of approach are so lighted as to make the unnoticed advent of a nocturnal visitor an impossibility.

A CITY SUBSTATION

A city substation in San Francisco permanently lighted by means of specially designed units, located at the curb line and equipped with 500-watt Mazda C lamps, backed by shell shaped reflectors and protected by hemispherical glass globe.

A modification of this system is one in which a number of flood lighting projectors are mounted on a watch tower overlooking the ground. By means of these, the guard located in the tower commands a view of the lighted zone entirely surrounding the plant. Augmenting this with a high tower searchlight for long distance work, an extremely large area can be covered very economically and with few guards.

Another method employed by one of the large Pacific Coast power companies is to mount projectors at some distance from their stations and power plants for the purpose of lighting up the buildings, as well as the surrounding area. A number of good illustrations of this method are given. The power house or substation is the heart of the city's lighting and power system and anything happening to them would seriously cripple not only the lighting of the city but also the power for the industrial plants. On the Pacific Coast this is particularly important since a large number of the industrial plants are directly dependent upon the central station for their power. Flood lighting the power house is protection at the source of power.

A FACTORY AT STOCKTON, CALIFORNIA

Here is an instance of how factories are flood lighted by night in order to safeguard the industry for national service.

POWER IN THE MANUFACTURE OF AGRICULTURAL MACHINERY

The United States Census Reports for 1914 just recently issued contain information as to the use of electric power in the manufacture of agricultural machinery. As compared with 1904, there has been a great increase.

The total primary power increased 35.3 per cent during the decade. Power generated by steam is the principal kind used, representing 65.6 per cent of the total in 1914, 71.5 per cent in 1909, 86 per cent in 1904. Water wheels, turbines, and motors have decreased in number from census to census since 1904, but show an increase of 32.2 per cent in horsepower for the period 1904-1909, and a loss of 2,699 horsepower, or 32.2 per cent, in 1914 as compared with 1909. The most important gain is shown for rented electric power, which increased from 3,828 horsepower in 1904 to 30,764 horsepower in 1914. In 1904 only 4.3 per cent of the total primary horsepower was rented electric power, but the proportion increased to 25.3 per cent in 1914. The electric motors run by power generated in the establishments reporting increased 360.1 per cent in number and 210.1 per cent in horsepower during the decade.

The number of steam engines and turbines decreased 32.7 per cent between 1904 and 1914, and electric motors increased more than sixfold in the same period. Of the total number of electric motors in 1914, 45.2 per cent were operated by rented power and 54.8 per cent by power generated in the establishments reporting.

DEPTH OF WATER FOR IRRIGATION

In Bulletin 115 of the Utah Station the moisture present just before and 24 hours after irrigation was determined on a large number of plants of loam soil on which different depths of irrigation were applied. The results are summarized in Table 1.

Table 1. Depth of Water Retained by Loam Soil From Different Irrigations.

Depth of irrigation. inches.	Number of trials.	Inches depth of water in upper 8 feet of soil. Before irrigation.	24 hours after irrigation.	Amt. unaccounted for.	Percentage unaccounted for.
2.5	36	13.42	15.90	0.02	1
5.0	236	17.31	21.07	1.24	25
7.5	77	15.58	20.85	2.23	30

These results show a considerable proportion of the water applied passed below 8 feet in depth when a depth of irrigation as small as 5 inches was used.

PRESENT STATUS OF INDUCTIVE INTERFERENCE

(Inductive Interference between power lines and telephone circuits has long been a problem that has perplexed engineers the country over. Especially has this problem proven difficult of solution in the West where hydroelectric powers in the mountain fastnesses must parallel for long distances the commercial lines of telephone companies. Here is an excellent resume of the final work on inductive interference which will prove of nation-wide interest. This article has been prepared for the Journal of Electricity by the California Joint Committee on Inductive Interference.—The Editor.)

With the presentation of its final report, dated September 28, 1917, the Joint Committee on Inductive Interference, which has been investigating for the past five years, under the auspices of the California Railroad Commission, the disturbances in communication circuits caused by induction from neighboring power circuits, announces the conclusion of its work.

A preliminary report was rendered by the Committee in 1914*. Besides a discussion of technical features of the problem, rules were recommended to the California Commission, to regulate the practices of companies operating power and communication lines in proximity to each other. These recommendations were embodied in General Order No. 39 of the Commission, which has been in force since August, 1914.

The final report just issued and based on more extensive investigations conducted since 1914, includes:

1. An historical sketch, regarding the formation, personnel, organization, investigations and finances of the Committee.

2. A review of the basic principles, comprising a simple statement of the nature of the subject, a summary of the facts established or agreed upon, and a concise statement of the guiding principles for the prevention of interference.

3. Recommendations for revised rules to govern the design, construction and operation of power and communication lines and associated apparatus, to prevent or mitigate inductive interference, followed by explanatory comments.

The new rules mark a considerable advance both in substance and form as compared with the 1914 rules. The principle of co-operation in determining means for avoidance or mitigation of interference is emphasized, in conjunction with definite guiding rules, where such are practicable. Certain precautionary measures are made applicable to all new construction. The principle of employing the remedial measure involving least total cost for a given benefit, irrespective of whose plant is changed, is declared. The arrangement of the rules has been entirely changed. A detailed summary of the recommended rules is given below.

An exhibit accompanying the rules, discusses the arrangement and spacing of power conductors.

4. Five appendices complete the report, dealing with:

(1) Interference not covered by the recommended rules, which apply to constant-potential alternating current power circuits of over 5,000 volts between wires, or 2,900 volts to ground, and exclude telephone subscribers' loops.

(2) List of technical reports prepared by the Committee as a record of its investigations.

(3) Comments on the 1914 report.

(4) A bibliography.

(5) A chart showing the organization of the Committee.

*See Trans. A. I. E. E., Vol. 33, 1914, p. 1441 to p. 1508.

The development of the power and communication services in California brought to a climax in 1912 the problem of interference by induction. The California Railroad Commission was called upon to adjudicate several cases of proposed power line construction paralleling long distance telephone, telegraph and railway signalling lines, which had been protested by the telephone interests. Before these cases came to a formal hearing, however, the companies principally concerned reached an agreement, which was approved by the Commission, to make a field investigation of the physical conditions involved in such interference. About two months later the Commission called a conference of representatives of the various interests in California, which was held on December 16, 1912, resulting in the formation of the Joint Committee on Inductive Interference, composed of engineers representing the Railroad Commission, railroads, power, telephone and telegraph interests of the State. This Committee, which was authorized to investigate and report to the Commission, took over the field work which had already been started by the companies as referred to above.

Under a Sub-committee on Tests, experimental investigations were conducted upon several long parallels involving a 22 k.v., three phase, 60 cycle system isolated from ground, and a three phase, 60 cycle system with lines of 22, 33 and 55 k.v., having grounded neutrals at one or more points, with long distance telephone, telegraph and railway signal lines. Most of these tests were made at Morgan Hill, Salinas and Santa Cruz, with the aid of a rather elaborate field laboratory, many of the tests being conducted with the power lines in normal operation.

A great amount of computation was required to analyze the experimental results, and besides this, theoretical studies were carried out. Much effort was required to develop suitable methods of measurement and to calibrate the instruments employed.

In the interest of a general survey of interference conditions in the State, information was collected from the several companies, concerning the parallels in which they were involved. Observations of the residuals of two grounded-neutral systems were carried out with a small portable outfit for measuring the magnitudes and frequencies of the harmonic residuals, at five different points besides those where the field laboratory was set up.

In giving its approval to the first report of the Committee, the Railroad Commission authorized the continuance of the investigation to secure more definite information concerning the effect of transpositions and the causes and effects of residuals. In carrying out this program, the field laboratory was moved to San Fernando where a 15 k.v. circuit, 37 miles in length, paralleled by a telephone circuit on the same poles, was entirely at the Committee's dis-

posal for several months. During this time, the factors affecting the residual voltages and currents of power circuits whether isolated or with grounded neutrals; the effectiveness of transpositions in neutralizing inductive effects; and the magnitude of inductive effects in short uniform non-transposed sections of parallels, were experimentally investigated.

Investigations of residuals included the effects of transpositions, leakage, accidental grounds and frequency of alternations up to 1,000 cycles, for systems isolated from ground; and for grounded-neutral systems, the magnetic density of the transformers and various connections of the transformer banks. In the Transactions of the A. I. E. E., Volume 34, pages 2,113 to 2,125, a more extensive description is given of the San Fernando investigations.

The subjects experimentally investigated at San Fernando were made the subject of intensive theoretical studies. In conjunction with the work on induction in short uniform untransposed parallels, calculations were made to determine the accuracy with which the interference could be predicted by computation. Since June, 1915, the headquarters of the Field Engineering staff have been at San Francisco where these studies and the later work of the Committee have been carried out.

The results obtained at San Fernando showed that it was feasible to study by means of computations the effect of variation of spacing of conductors, separation of power and communication lines, size of conductors, heights above ground and configuration, on the intensity of induction. A study has been made covering the configurations, relative positions, etc., most commonly occurring for three-phase lines, the results of which are embodied in Technical Report No. 65 of the Committee, comprising 214 curve sheets and over 3,000 curves.

Coincident with its investigations, the Committee arranged for tests by the American Telephone and Telegraph Company, Western Union Telegraph Company and the Postal Telegraph Cable Company to determine the detrimental effects of extraneously induced currents on the operation of telephone and telegraph receiving apparatus, that is, the interference due to specified amounts of current of a given frequency in telephone receivers and in telegraph relays.

The detailed record of the investigations of the Committee is contained in a series of 71 technical reports. Thirty of the reports have been selected as being of sufficient general interest to warrant their publication along with the two reports of the Committee to the California Railroad Commission. The reports include not only records of tests and their analyses, but give the methods of working, theoretical discussions, forms for systematizing experimental and theoretical work, and data of general usefulness in predetermining the magnitude of induction to be expected under given conditions and in prescribing remedial measures. All these reports are on file at the offices of the Railroad Commission in California, but unless they are published, the valuable information they contain will not be generally accessible. Their publication, however, is contingent upon the receipt of a sufficient number of orders substantially to defray the cost of printing and binding. All persons who are interested in procuring a copy of this publication are requested to notify Richard Sachse, Chief Engineer, Railroad Commission of California, 833 Market street, San Francisco, to this effect.

Conditions of proximity of power and communication lines that cause inductive interference are designated by the Joint Committee as "parallels." In preparing the final report, a large amount of study was given to the question of determining the conditions of length, separation, voltage, current, wave shape, balance, conductor arrangement, etc., that would constitute a "parallel." In order to set forth the relations in reasonably simple form, it was necessary to assign definite values to several factors which in practice vary widely in value and which it is usually not feasible to determine in particular cases. It was found that sufficient information was not at hand to satisfy all parties as to the assumptions regarding these factors. The Committee feared that a definition of these relations, based on such assumptions, would be used in cases where the assumptions did not apply. Consequently the report does not include such a definition. The record of work done on this complex problem remains, however, of great value as indicating the general method of attacking the problem, the difficulties to be overcome, and the accomplishment of results up to date.

The report gives the following as the seven "basic physical principles which underlie the rules recommended and which should guide all efforts to prevent inductive interference":

1. **Avoidance of close proximity.**
2. **Elimination or suppression of harmonics.**
3. **Limitation of residuals.**
4. **Reduction of intensity of induction by favorable arrangement of conductors.**
5. **Neutralization of induction by co-ordinated transposition systems.**
6. **Balancing of metallic communication circuits.**
7. **High grade construction and care in the operation and maintenance of power circuits.**

A brief summary of the recommended rules follows:

The first section entitled: "General Provisions" provides for: (a) Applicability of the rules. Rules on operation and maintenance are to apply throughout; rules for specific parallels, to cases hereafter created; rules not limited to lines involved in a parallel, to new construction, and in the event of reconstruction. (b) Co-operation. (c) Method of remedy involving the least total cost. (d) Existing parallels are to be cared for with due diligence, depending on the seriousness of their effects.

The second section consists wholly of definitions.

The third section entitled: "Location of Lines" requires: (a) Avoidance of parallelism wherever practicable. (b) Advance notice of intention to construct a line which will create a parallel. (c) The distance between parallel lines to be made as great and as uniform as practicable. Where other remedies fail, the separation is to be increased. (d) and (e) Parallels shall be as short, and as free from discontinuities as practicable. Unnecessary crossings of highways are to be avoided.

The fourth section entitled: "Design and Construction of Lines" (a) Requires attention to quality and workmanship to prevent failures causing interference. (b) Consideration of the configuration of power circuits is required, also the avoidance of excessive spacing, long two wire branches from

three phase lines, and single wire grounded circuits. (c) Power circuits are to be transposed throughout their lengths with barrels of 6 to 12 miles, excepting lines under 12.5 k.v. with grounded neutrals and certain lines located on private rights-of-way. Existing power circuits are to be transposed outside parallels hereafter created when necessary for capacitance balance, with regard to discontinuities. (d) Inside parallels an adequate transposition scheme, consisting of coordinated transpositions in the power and communication lines, if the latter are metallic, is to be installed, determined by co-operative study. In general, at least one barrel shall be placed in the power circuit. At highway separations from telephone lines, three mile barrels should ordinarily be employed. For parallels with telegraph lines six mile barrels are ordinarily sufficient. The most economical scheme and utilization of existing transpositions are to be considered.

The fifth section is entitled: "Design, Construction and Arrangement of Apparatus." It provides for: (a) Quality and arrangement of apparatus to minimize interference. (b) Rotating machinery should have good wave form. Grounds on generators are to be avoided, unless the arrangements are such as to avoid unbalancing the circuit and introducing residuals. (c) Transformer exciting currents should be as low as is consistent with good practice (for most cases less than 10 per cent at normal voltage). Grounded single-phase, grounded three-wire two-phase, and grounded open-star three-phase connections are prohibited. Star connected auto transformers with grounded neutrals on three-phase lines in parallels must also have low-impedance, delta-connected windings, or other equivalent means of suppressing triple harmonic residuals. (d) Auxiliary devices to prevent distortion of the waves by rectifiers, etc. are to be installed where necessary. (e) One oil switch with poles mechanically interconnected for simultaneous operation is required between a parallel and the source of supply of the power line to operate automatically in case of abnormal conditions, except where an operator is on duty. Consideration is to be given to switching arrangements to minimize transients. Where air-break or single-pole oil switches cause trouble, oil-switches with poles interconnected are to be used. (f) Fuses are to be avoided for main lines in parallels. (g) Electrolytic lightning arresters are to be equipped to minimize their disturbing effects. (h) Indicating devices are to be provided at supply stations to give warning of abnormal conditions, and ammeters are to be installed in important neutral-ground connections. (i) Apparatus for metallic communication circuits is to be well balanced.

The sixth, and last, section is entitled: "Operation and Maintenance" and requires: (a) All reasonable care by power and communication interests to minimize interference and, in particular: (b) prevention of mechanical and electrical failures which would cause or promote transient disturbances and unbalanced loads. (c) Daily record of current in grounded neutrals of important stations. (d) Transformers are not to be operated at more than specified percentages above normal voltage. (e) Care shall be exercised to avoid switching disturbances. (f) Where lightning arrester charging disturbs, it should be done in the early morning. (g) A definite procedure shall be provided for station operators during times of abnormal unbalance on power lines involved in parallels. In general, the section of a faulty line passing a parallel should be disconnected until cleared, and not energized more than once in locating the fault. To facilitate the study of such cases, accurate records are to be kept of occurrences under abnormal conditions.

The entire work of the Joint Committee on Inductive Interference constitutes a notable example of the efficiency of co-operative work of engineers representing conflicting interests in lieu of methods of litigation based upon meager information concerning the underlying principles and facts of a complex problem. As perhaps the chief result of this effort on the part of the Joint Committee, there has been created in the State of California a realization of the seriousness of inductive interference, an understanding of practical preventive and remedial measures, and most important of all, a disposition on the part of the power and communication companies to co-operate in the solution of the problems which arise from the construction of the two classes of lines in proximity.

That the work of the Joint Committee is fully appreciated by the California Railroad Commission is evident from a letter written by the Commission to the members of the Committee, in which it says:

"In receiving this final report and in accepting the resignations of the members of the Joint Committee, we desire to express to each member of the Committee our very sincere appreciation of the splendid work which the Joint Committee has done during the last five years. The work in its complete form is a monument to this Committee of which each member must be justly proud."

It is a matter of considerable importance to interested utilities, commissions, and scientific men in other states that the results of the Joint Committee's investigations in California will now become available throughout the country.

THE NATIONAL ASSOCIATION OF CORPORATION SCHOOLS

Dr. Chas. P. Steinmetz is quoted as saying:

"Vocational training is the most important industrial problem in this country. . . . The superiority of America in the electrical industry over all other countries is due largely to educational development and co-operation between the manufacturing companies and educational institutions."

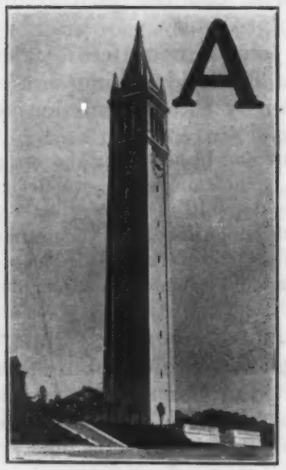
It is just this specialized training—in retail and general selling, in the trades and in office work, that the National Association of Corporation Schools was organized to promote. It is an association of corporations to help them in the specialized education of their employees. It covers other aspects of business efficiency also—the so-called welfare work. Reports have been made on employment plans, safety and health, vocational guidance, public school education, profit sharing, insurance and pension plans. Thus it has become a forum for the interchange of ideas on the principal factors that make for increased efficiency of the working force.

There are three classes of membership in the association: Class A membership is restricted to corporations, firms or individuals employing persons in industrial, commercial, transportation or governmental enterprises. Class B is an individual membership, restricted to employees of Class A members. Class C is open to individuals, not eligible to Class A or Class B membership, who may be interested in the work of the association.

The work of the association is under the direction of an executive committee made up of executives from the various concerns who are members and of prominent educators. The President at the present time is J. W. Dietz of the Western Electric Company and the Executive Secretary F. C. Henderschott of the New York Edison Company.

ELECTRICAL FEATURES OF THE CAMPANILE CLOCK

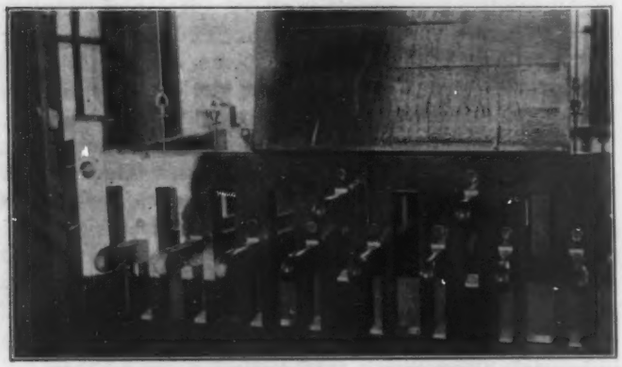
(A telephone to be installed in a tower where there is no one to answer it except the man who runs the elevator and an electric clock which failed to keep time—these were two of the electrical problems connected with the campanile at the University of California. The chimes of the Mills College Campanile have recently been connected up with an electrical keyboard, but as yet the Berkeley chimes are hand operated.—The Editor.)



For some time the four faces of the clock failed to agree

A TALL white shaft of granite rising some three hundred feet above the University of California Campus — the campanile is always one of the sights of interest to the visitor to central California. Aside from the sheer beauty of its erectness, however, the building is of interest from the peculiar electrical problems it presents.

In the first place, it was found necessary to provide telephone communication between the caretaker and the University offices. The shaft is provided with elevator service, the elevator making the trip every fifteen minutes, remaining a few minutes at the top, descending, picking up its passengers and rising immediately again. As there are practically always students or visitors waiting to make the trip, the elevator is almost constantly in motion. It proved impractical, therefore, to place the telephone instrument either at the top or bottom of the shaft, there being no one to answer it, and so, with a little ingenuity, it was placed in the elevator itself.

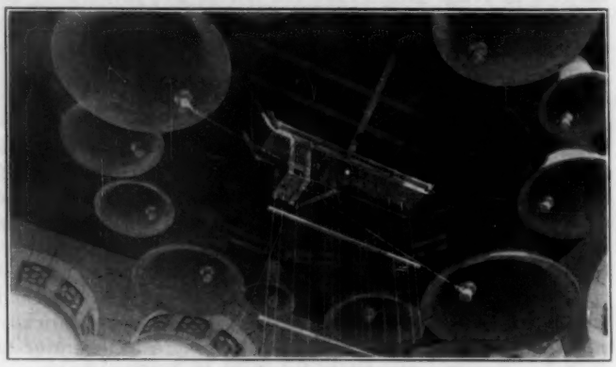


The chimes are hand operated, the entire equipment and keyboard being brought from England

It seems rather startling at first to hear the telephone ring and a conversation carried on while the elevator is in motion, but it is really simple enough, the instrument being connected with a long cord with enough slack to permit the motion of the car.

A second problem was met with in connection with the tower clock. The master clock is located at the base of the campanile, from where it is connected by wires to the University Observatory and from there kept true to standard time. The clock itself is connected electrically with the four mechanisms which govern the hands on the four faces of the tower. Every half minute a contact is made and an electrical impulse is sent upward that simultaneously winds the mechanisms which thereupon move the giant hands the foot or so which represents a half minute on the dial.

It was soon discovered, however, that the tower clock was keeping poor time—the hand on one face would crawl continually forward, making the circuit of twenty-four hours in an hour or two, on another it would register several minutes late. This was traced



Looking up into the bells—the tenor bell is later to be electrically connected with the master clock and strike the hour

to a difficulty in the winding mechanism. Carbons were used to make the contact and these were subject to varied accidents. Sometimes they fused, making the contact continuous, occasionally they failed to make any contact at all. Finally copper was substituted in their place and up to the present time has proved entirely satisfactory.

Up to a short time ago, the clock was mute. The great bells which were to provide the chimes were made in England and the risk of submarines and war conditions prevented their being shipped. Hours were struck on the old Bacon Hall clock located just behind the campanile so that often enough the apparent striking of the hour and the position of the hands on the great clock failed to agree.

About a month ago the bells arrived from England together with the keyboard and operating device and were set up in the tower. The chimes are not operated electrically but by hand, with the idea that greater variety and feeling can be obtained in this way. The clappers are held by a spring attachment close to the rim of the bell and connected by wires to the handles on the keyboard below. A sharp pressure on the handle sends forth a peal on the bell. One sharp and one flat are provided, so that it is possible to play selections in three keys.

When the copper contact for the tower clock is finally acknowledged as permanently satisfactory and accepted, the tenor bell is to be electrically connected with the master clock below and will ring hours and half-hours.

LIGHT DISTRIBUTION FROM PROJECTORS

BY WALDO C. COLE

(The problem of just what light may be expected from a parabolic reflector under practical conditions is one which it is possible to work out mathematically as is pointed out in the article below. From these calculations it is obviously possible to figure out in advance just how many lights would be needed to illuminate a given area to a given intensity. With the spreading use of flood lighting for protective as well as ornamental purposes, this contribution should prove extremely valuable. The author is in charge of industrial investigations for the San Francisco office of the Westinghouse Electric Company.—The Editor.)

The distribution of light flux or light intensity of an illuminant depends upon the physical shape of the radiant body. By placing selected objects, such as mirrors, etc. around a light source, the distribution of light flux can be changed to meet a predetermined condition.

Distribution curves for three elementary forms of radiant bodies of equal total useful light flux output are shown in Fig. 1. Curve 1 is the distribution from a point source of uniform intensity, an ideal, not a practical condition.

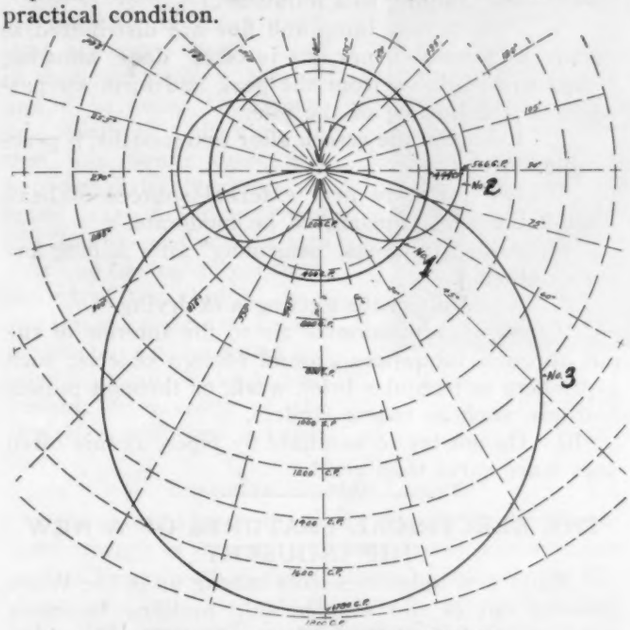


FIGURE 1—DISTRIBUTION CURVES

Light distribution from—
1 A point source or small sphere of uniform brilliancy
2 A straight line or cylinder of uniform brilliancy
3 A circular plane of uniform brilliancy
The total light flux from each equals 5584 lumens.

The distribution of intensity represented by curve 2 is that of cylindrical radiant body such as a straight section of an incandescent lamp occupying a vertical position.

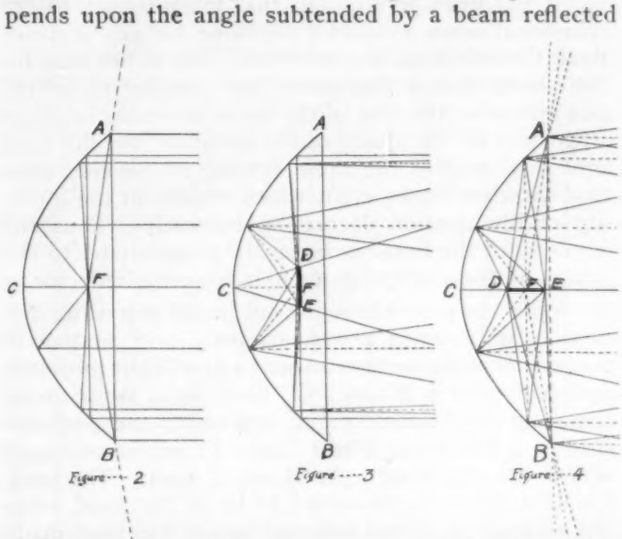
A circular disc of uniform brilliancy in a horizontal position with the luminous side down will give a distribution curve as shown by curve 3 with its maximum intensity vertically downward.

If the three elementary light sources, whose distributing curves have been discussed, were each placed at the focal point of a parabolic reflector, the rays of light falling on the reflector would be reflected as illustrated in Figs. 2, 3, and 4.

In the case of the point source of uniform intensity, as we know, the reflected light rays will be parallel to the axis of parabola as shown in Fig. 2, thus resulting in a uniform beam of light having the same intensity, neglecting absorption, at all points along the axis of the beams.

The light reflected from the parabolic reflector when the source is a circular disc of diameter DE (Fig. 3) , with its center located at the focus F of the parabola and radiating light only from the side next the reflector, results in a beam conical in form and not a true cylinder as in the case of the point source. The light rays originating at the center of the disc and falling on the surface of the parabola alone will be reflected parallel to the axis; those originating from other parts of the light source will be reflected with a certain deviation from parallelism depending upon the position of their origin on the surface of the disc and the point from which the rays are reflected on the surface of the parabola. The greatest divergence of the beam from a path parallel to the axis occurs when the light rays from the circumference of the light source are reflected from the vertex C; this condition is indicated in the illustration by a line from D to C, in. return reflected through the point E on the edge of the disc. From this it is seen that to determine the maximum divergence of the reflected beam with a disc source of light such as the incandescent end of an electric arc electrode, all that is necessary is to find the value of the angle DCE when the center of the disc is at the focal point F of the reflector.

With a cylindrical light source placed in the position DE where its middle point is shown at the focal point of the reflector (Fig. 4), the reflected light as indicated will again deviate from the cylindrical form and become conical, whose divergence or spread depends upon the angle subtended by a beam reflected



FIGURES 2 TO 4—EFFECT OF DIFFERENT LIGHT SOURCES

The distribution of rays from a parabolic reflector when the source of light is a point, a circular disc and a cylinder respectively.

from some point on the surface of the parabola between the edge A and the vertex C. The location of this point, of course, depends upon the individual characteristics of the reflector under consideration.

It is easy to see that if the light source in the last two examples were not located with its center at the focal point, the divergence or spread of the beam would be greater than shown in the illustration, providing the radiant bodies were the same size as those used in the preceding discussion.

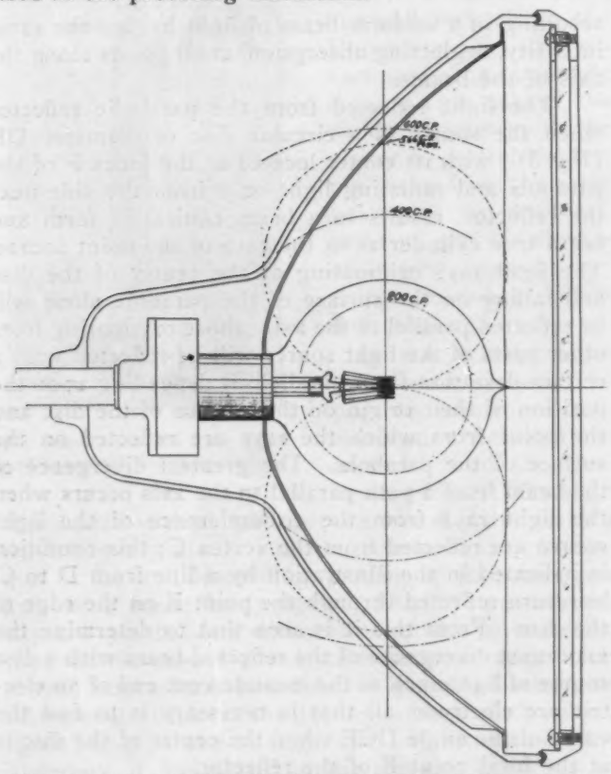


FIGURE 5—THE DISTRIBUTION OF LIGHT ZONES FROM A MAZDA C. LAMP

Note the areas of greatest intensity—this is the effect of light distribution from a source which combines the effect of the vertical and horizontal.

It has been pointed out that the intensity of the cylindrical beam would be the same for any distance along the axis from the reflector. This is not true for the conical beams because as the distance along the axis increases, the area of the beam increases in direct proportion to the square of the distance; but the total light flux remains the same (giving no consideration to absorption losses, etc.), which results in the intensity of illumination decreasing inversely. Thus the intensity of the beam is inversely proportional to the square of distance along the axis from the reflector.

With the points brought out in the preceding discussion, it becomes a comparatively easy matter to predetermine the performance of a flood light projector equipped with a Mazda "C" flood light lamp under operating conditions. Fig. 5 represents the performance of a Universal Flood Light Projector equipped with a 400-watt flood light Mazda C lamp. The lamp filament center is presumed to be at the focal point and an analysis of the reflected beams has been made in the same way as for the elementary light sources to determine the spread.

One point that must be borne in mind in making application of flood light projectors is that the beam is not of uniform intensity but as would be expected from a close study of Figs. 3 and 4, the greatest light flux density is at the center of the beam. This is clearly shown by a number of photometric curves exhibited in the N. E. L. A. Commercial Section Published Papers and Reports of the Fortieth Convention

BUREAU OF MINES TELLS HOW TO STORE COAL

In view of the fact that so many utility and power companies are storing coal, it is thought that the following ten pointers issued by the United States Bureau of Mines will be of interest:

1. Do not pile over 12 feet deep, nor so that any point in the interior of a pile will be over 10 feet from an air-cooled surface.
2. If possible store only screened lump coal.
3. Keep out dust as much as possible. (To this end reduce handling to a minimum.)
4. Pile so that lump and fine are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile.
5. Rehandle the screen after two months, if practicable.
6. Do not store near external sources of heat, though the heat transmitted be moderate.
7. Allow six weeks' "seasoning" after mining and before storing.
8. Avoid alternate wetting and drying.
9. Avoid admission of air to the interior of the pile through interstices around foreign objects, such as timbers or irregular brick work, or through porous bottoms, such as coarse cinders.
10. Do not try to ventilate by pipes, as this often does more harm than good.

THE ELECTRICAL FEATURES OF A NEW SHIP INDUSTRY

Many new industries have sprung up in the West, growing out of the wooden ship building business. Not the least interesting is the turning of spars, which is now handled by such concerns as the Western Spar Company of Portland, Oregon. This used to be hand labor—at best handled by steam run machinery—today the entire equipment is electrical.

There are two large wood working lathes, which are equipped so that the timber in the lathe turns at the same time as does the cutting tool which runs on a carriage on a track beside the timber. This plant can turn spars up to 160 feet in length.

The equipment used in this plant consists of 220-volt, 3-phase induction motors as follows: three 15 h.p., three 5 h.p., three 1 h.p. and one 3 h.p. All of this equipment had to be built on the ground as no company was in a position to furnish it.

The 15 h.p. motors are on the carriages to drive the cutting tool and other apparatus and have to be installed with long flexible cable connections so that they may be run back and forth over the 160 foot length of track. This is accomplished by plugging in the center of the run and supporting the cable on strain insulators strung on a steel messenger wire.

WATER POWER IN SOUTHWESTERN UNITED STATES

BY E. C. MURPHY

(Although the rainfall reported for any given year may run into several inches, the question of importance in southwestern power development is the problem of the dry periods. The excessive evaporation and the rapid accumulation of silt make storage difficult. A review of such problems is interestingly presented in the following article. The author is hydraulic engineer with the United States Geological Survey.—The Editor.)

The utilization of water power depends chiefly on the available markets, the cost of fuel power, the magnitude and regularity of the discharge of the streams, and the extent to which the streams are used for other purposes. The Southwest is so largely undeveloped, especially New Mexico and Arizona, that the markets for power at the present time are very small. Coal is abundant in New Mexico and oil in Texas, Oklahoma, and Southern California, so that fuel power there will be comparatively cheap for many years. A person seeing the Southwest during a wet year and having only a short record of the run-off of a stream may form a very erroneous opinion of the possibility of using that stream, on account of the climatic conditions existing there.

GRANITE REEF DAM

A reservoir of the Southwest which diverts the waters of the Salt and Verde rivers upon 240,000 acres of land.

Excessive Storage Losses

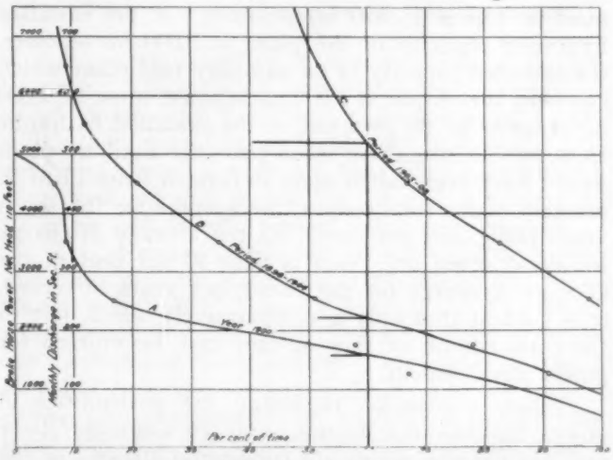
On account of the long dry periods in the Southwest storage is necessary to utilize any considerable part of the run-off of the streams. The average discharge of Verde River at the mouth during June and July, 1900, was only 7 per cent of the average discharge for the 26 years of record. Two features of the Southwest, namely excessive evaporation from reservoir surfaces and large volume of silt transported by the streams, have important bearing on the value of storage.

The volume of silt carried in suspension by a few streams in the Southwest has been measured for short periods. These measurements show that the streams in this part of the United States carry a much larger proportion of silt than streams in other parts of the country. The most recent estimate for Gila River at the San Carlos reservoir site is that the volume of silt when consolidated in the bottom of that reservoir will be on the average 4,500 acre-feet per year, or 1.3 per cent of the average annual run-off. If the capacity of this reservoir is 54,000 acre-feet it will fill with silt in 12 years, and if its capacity is 18,000 acre-feet it will fill with silt in 4 years of average run-off.

The water of the smaller streams in the timbered parts of the Southwest is generally nearly clear, but during floods many of these streams carry a large volume of sand, gravel and bowlders. It is reported that the capacity of Santa Fe reservoir on Santa Fe Creek, New Mexico, was reduced 40 per cent by debris brought down by one flood. Unless the reservoir on these small streams is built in a depression off the main stream, or provision is made for passing the coarser debris around the reservoir, its life will be comparatively short.

Power Available

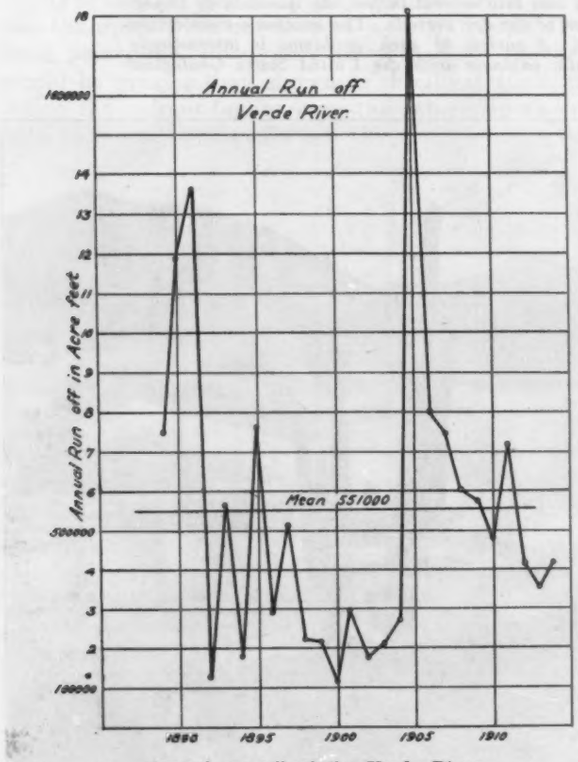
The continuous power that can be generated from the streams in the Southwest without storage is small



AVAILABLE POWER ON VERDE RIVER

Power available near mouth of Verde River from a plant with a net head of 110 ft. and turbine efficiency of 80 per cent for varying proportions of the time.

compared with that available during wet periods or during years of average run-off. This fact is well illustrated by the curves in the accompanying figure, which show the power available on Verde River near its mouth from a plant having a net head of 110 feet and turbine efficiency of 80 per cent for varying proportions of the time of three periods. Curve A is for the year 1900, curve B for the seven years 1898-1904 and curve C is for the four wet years 1905-8. It can be seen that during 60 per cent of the wet period 5,200 horsepower was available, during 60 per cent of the dry period 2,200 horsepower was available and during 60 per cent of the year 1900 only 1,600 horsepower was available. The average discharge during this seven-year period is 300 second-feet and the corresponding power is 3,000 horsepower. The smallest recorded discharge is 32 second-feet and the corresponding power is 320 horsepower. If the installed hydraulic capacity of the plant is 3,000 horsepower, the installed capacity of an auxiliary fuel plant which can keep the output at 3,000 horsepower must be 2,680 horsepower or 89 per cent of the installed hydraulic capacity. During these seven years the auxiliary plant would have been called upon to furnish from 15 to 50 per cent of the total output, the average for the seven years being 26.4 per cent. As the average discharge for these seven dry years is only 40 per cent of the average discharge for the twenty-six years of record, it is evident that only a comparatively small part of the total run-off of this stream can be utilized for power development.



Annual run-off of the Verde River

These statements regarding the possibilities of power development do not apply to Colorado River and Rio Grande, which are considered streams of the central West rather than the Southwest, nor to a few of the smaller streams such as Fossil and Cataract creeks in Arizona and Tularosa River in New Mexico that are fed by springs.

ECONOMIZING ELECTRICITY IN PETROGRAD

In view of the serious shortage of hard mineral fuel and wood, municipal works have been forced to curtail their consumption of fuel, with a consequent lowering of production following the ruling of a government committee on fuel saving.

The committee has found it possible to reduce the running schedule of street cars by one hour and will keep in operation the plan of moderate speed that was recently introduced. Among other things, the experiment of decreased speed has given the following results: An economy of fuel amounting to 18 per cent, 30 per cent fewer cars "laid up," and a decrease in daily expenditures amounting to about 3,000 rubles.

The committee recognizes the necessity of continuing the lighting in the central part of the city, but instead of all the lamps being used, only those at prescribed intervals will be lighted. The committee has decided to set a definite hour later than which current will be sent from the station to houses only at an increased rate, which is high enough to prevent most people from using electric light at this time. It was also decided to give special attention to electric signs in moving-picture houses, theaters, and shop windows, in order to put a complete stop to the use of power for such purposes.

Waterworks—Fuel Regulation in All City Enterprises

The question was also raised of economizing fuel in the municipal waterworks. It was decided that curtailing the activity of the waterworks, with the consequent lessening of the water supply, would not be advisable, but possible economies were seen in connection with the purification of the water. In the past purification of the water has been accomplished by a double process, filtering and chlorinating, of which the former is the more radical and consumes more fuel. It was decided to use in preference the method of chlorinating.

This commission has to work out binding rules for the economic use of fuel in all city enterprises. The necessity of such orders is shown by the careless handling by firemen of coal and petroleum. A technical survey of the department activities gave surprising figures. Thus, in one electric-lighting company, the cost of fuel went 17 per cent above the norm, solely on account of the carelessness of the firemen. Similar results were obtained from a number of other undertakings that were investigated.

ELECTRIFYING RAILROADS IN ENGLAND

Pointing to the successful electrification of American railroads, the Electrical Review of London urges that the policy be further extended in England. English railways have thus far furnished discouraging statistics, but nearly all of these projects originated before the war, when the cost of fuel and labor were relatively much more favorable than they are now, or will be after the war, i. e., the conditions are becoming such that the paying limits of electrification will be greatly extended. Under the probable conditions of the near future British main-line operation by electric traction may become an economic necessity.

CURRENT RATE FIXING PROBLEMS

BY C. E. GRUNSKY

(The problem of how far the need of the purchaser should enter into the determination of a fair value is one which enters particularly into the problem of reservoir valuation. The market price of the property as it might be used for other purposes in many cases is an even more important consideration. The following compilation of charts and tables covers the situation in the San Francisco Bay region and is characteristic of similar problems elsewhere. The author is a recognized authority on valuation problems.—The Editor.)

THE APPRECIATION OF LAND VALUES AND THE RESERVOIR SITE

The value of reservoir land is not necessarily greater than the value of the same land for other uses. The case may readily be conceived where alternative uses will create values in excess of the amount which could economically be invested in the reservoir property. Under such circumstances either the necessity for the utilization of the site does not exist because alternative sites are available or the water-works system must get along without the storage which the reservoir would have afforded.

The problem of determining the market value of reservoir lands is one of the most difficult that can be presented to the engineer. The question is not what such lands may be worth as a part of a water-works system and how great the sacrifice which an owner of such water-works would make rather than to be deprived of the use of the reservoir, but what is their value in the hands of an owner not in the water supply business as determined by the competition for their acquisition that would exist between various parties who could utilize them sooner or later for reservoir purposes. The problem will involve the weighing, in each case, of all attendant circumstances. This is particularly true when, as in the case of the Spring Valley Water Company's reservoirs on the San Francisco peninsula, the sites occupied are the only ones of their character which are available to adequately fulfill their purpose.

When the reservoir site to be valued is not already in use but the necessity for its use is pressing, it may be proper to determine an upper limit of value by comparison with the next most available source of supply. But any limit thus ascertained is not market value, though it may occasionally be the measure of what the party desiring to use the reservoir property can afford to pay.

Referring now to the increasing value of land in the San Francisco Bay region, the statement may be repeated that land taken in its entirety is increasing in value. Values are increasing not alone at and near population centers but also in broad zones which are more or less directly under the influence of these population centers, and, in fact, wherever population growth and the resulting modification of transportation facilities, by rail, by water or on improved highways have affected or are likely to affect, in not too remote future, the use to which the land can profitably be put.

While this is true and while the possibility is recognized of developing a law approximately true, connecting land value, measured in terms of money, with population or regional density of population, there will always be local exceptions to any such law. There may be localities too, where the change due to environment will be from a higher to a lower use where value will decrease instead of following the general law of increase. Furthermore, regularity in the rate at which land values advance is not to be expected. A long continued, well defined upward movement in land values has repeatedly, in the history

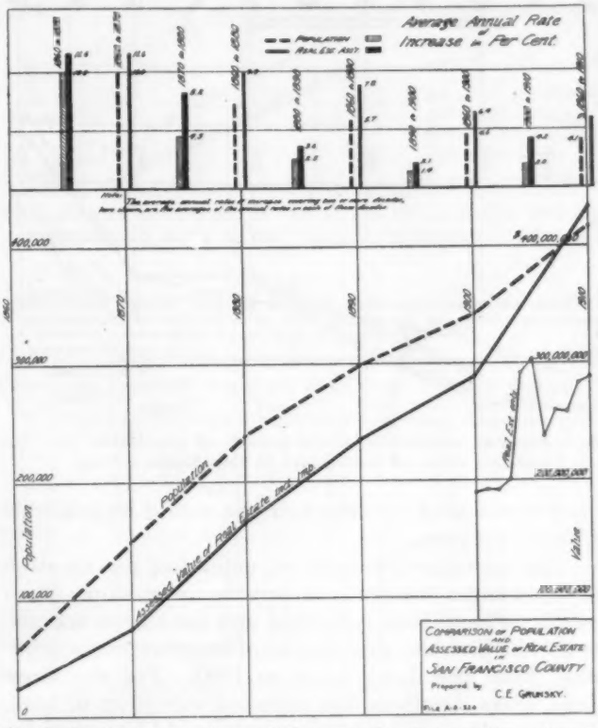


Chart showing comparison of the growth of population with the assessed value of real estate in San Francisco County

of this country, resulted in over-speculation, creating temporary unwarranted or fictitious high values from which there was thereupon a recession or beyond which there would be no further advance until, in the course of time, due to all the factors incident to growth of population and the demand of society for fuller utilization still higher value was created.

To determine population growth and the increasing value of farm lands recourse may be had to the statistics collected by the U. S. census and to the annual county assessments. The facts here presented are the result of recent studies. Due allowance should be made, however, for human frailty and the vagaries of the various assessors and statisticians whose judgment and skill are reflected in the available reports. The figures as presented are but an imperfect guide to what has taken place in the past and should be dis-

counted somewhat when attempting a forecast of what will take place in the future.

Confirmation of the increasing value of land generally and therefore of reservoir sites will be found also in the fact that there has been a constantly increasing density of population in the Bay region, and a corresponding increase in the demand for lands such as those in the various reservoir sites of this region

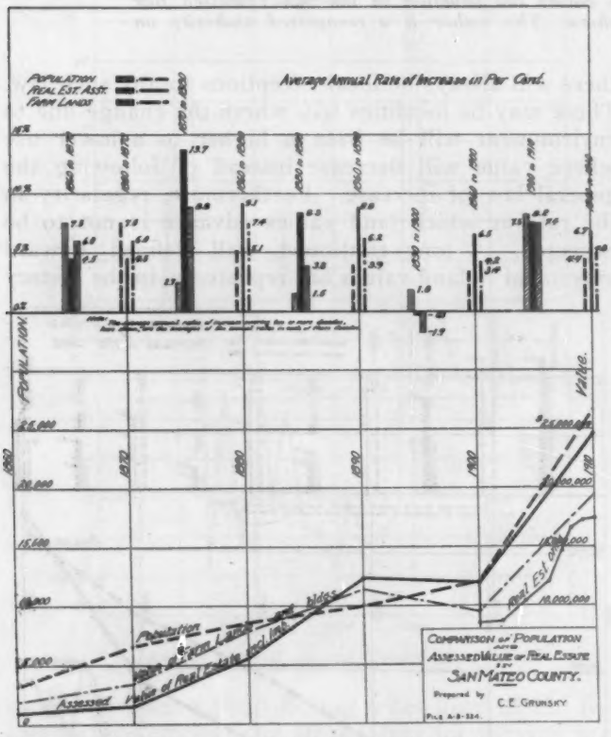

Average Annual Rate of Increase in Per Cent.
Population
Assessed Value of Real Estate and Improvements
Comparison of Population and Assessed Value of Real Estate in San Mateo County.
C.E. Grunsky

Chart showing comparison of the growth of population with the assessed value of real estate in San Mateo County

which if not held for reservoir use would be available for other purposes.

The assessors' records of valuation for taxation purposes cover the lands in private ownership. Such records as have been published and have been accessible do not give the assessment of improvements separately from the land prior to 1900. For the more recent years, however, the assessed valuation of land, without inclusion of improvements could be noted for some of the counties.

It appears from the tables and diagrams which have been prepared showing this information for California, for the City and County of San Francisco, and for the counties of San Mateo, Santa Clara, Alameda and Contra Costa that: —

During the 40 years following 1870 the population growth of the State of California when considered by ten year periods has been at an average rate per decade of 44% or about 3.7% per year.

The population growth of San Francisco has been about 30% per decade on an average for the same 4 decades or about 2.7% per year.

The population growth of Alameda county in the same period has been about 59% per decade or about 4.8% per year.

The population growth of Santa Clara county in the same 40 years has been about 34% per decade or about 3.0% per year.

The population growth of Contra Costa county in this period has been about 39% per decade or about 3.2% per year.

The population of San Mateo county has increased during the 40 years under consideration between 3% and 4% per year. During the 20 years 1880 to 1900 the population growth in this county was only between 1.5% to 2% per year.

The population of California and of each of the five counties, San Francisco, San Mateo, Santa Clara, Alameda and Contra Costa, as determined by the U. S. census at ten year intervals since 1860 is noted in Table 1.

TABLE 1.
Population of California and of Counties in the South San Francisco Bay Region

Year	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1850	92,597					
1860	379,994	56,802	3,214	11,912	8,927	5,328
1870	560,247	149,473	6,635	26,246	24,237	8,461
1880	864,694	233,959	8,669	35,039	62,976	12,525
1890	1,213,398	298,997	10,087	48,005	93,864	13,515
1900	1,485,053	342,782	12,094	60,216	130,197	18,046
1910	2,377,549	416,912	26,585	83,539	246,131	31,674

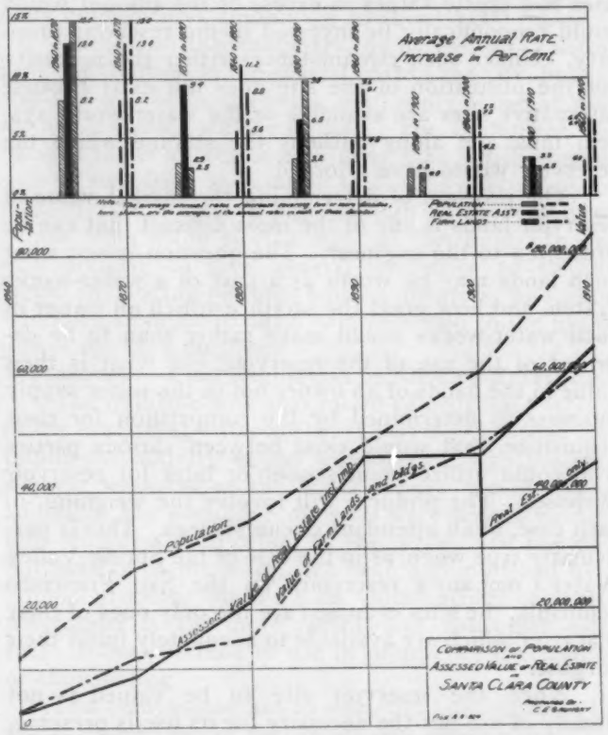

Average Annual Rate of Increase in Per Cent.
Population
Assessed Value of Real Estate and Improvements
Comparison of Population and Assessed Value of Real Estate in Santa Clara County

Chart showing comparison of the growth of population with the assessed value of real estate in Santa Clara County

TABLE 2
Population Growth
California and South Bay Counties
Increase since last Census

Decade	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
			Per Cent in the Decade			
1860-70	47.4	163.1	106.4	120.3	171.5	58.8
1870-80	54.3	56.5	30.7	33.5	59.8	48.0
1880-90	40.3	27.8	16.4	37.0	49.0	7.9
1890-00	22.4	14.6	19.8	25.4	38.7	33.5
1900-10	60.1	21.6	119.8	38.7	89.0	75.5
			Per Cent per Annum			
1860-70	4.0	10.0	7.5	8.2	10.5	4.8
1870-80	4.4	4.5	2.7	2.9	4.8	4.0
1880-90	3.4	2.5	1.5	3.2	4.1	0.8
1890-00	2.0	1.4	1.8	2.3	3.3	3.0
1900-10	4.8	2.0	8.2	3.3	6.6	5.8

If assessors' valuations for taxation purposes be accepted as the basis (however unsatisfactory this may be for individual years) for determining the periodical increase in the value of real estate, the result will be as shown in Table 4. The figures representing tax values are as reported by the several county assessors or as modified by the State Board of Equalization and published in the reports of the State Controller.

TABLE 3

Population Growth
California and South Bay Counties

Mean of the average annual percentage rates of increase in the several decades since 1860

	California	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1860-70	4.0	10.0	7.5	8.2	10.5	4.8
1860-80	4.2	7.2	5.1	5.5	7.6	4.4
1860-90	3.9	5.7	3.9	4.8	6.5	3.2
1860-00	3.5	4.6	3.4	4.1	5.7	3.1
1860-10	3.7	4.1	4.3	4.0	5.9	3.7
1870-80	4.4	4.5	2.7	2.9	4.8	4.0
1870-90	3.9	3.5	2.1	3.0	4.4	2.4
1870-00	3.3	2.8	2.0	2.8	4.1	2.6
1870-10	3.7	3.5	3.5	2.9	4.7	3.4
1880-90	3.4	2.5	1.5	3.2	4.1	0.8
1880-00	2.7	2.0	1.6	2.7	3.7	1.9
1880-10	3.4	2.0	3.8	2.9	4.6	3.2

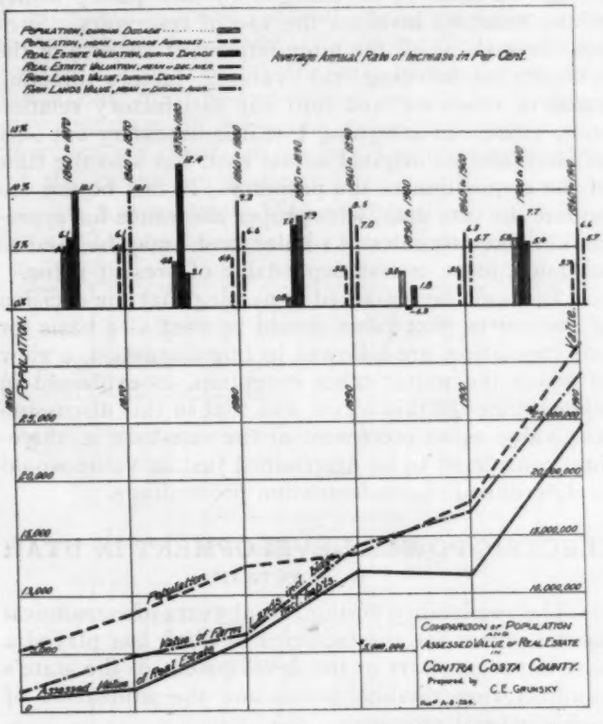

Average Annual Rate of Increase in Per Cent.
Population
Assessed Value of Real Estate
Value of Farm Lands
Comparison of Population and Assessed Value of Real Estate
Contra Costa County.
Prepared by C.E. Grunsky

Chart showing comparison of the growth of population with the assessed value of real estate in Contra Costa County

In Table 5 comparisons are made between the rate at which population is increasing in the bay counties with the rate at which the taxation value of real estate is increasing.

TABLE 4

Valuation for Taxation Purposes
San Francisco Bay Counties
Real Estate and Improvements

Year	San Francisco	San Mateo	Santa Clara	Alameda	Contra Costa
1860	25,125,800	996,400	2,584,700	2,290,700	1,050,900
1870	75,146,000	1,533,450	8,733,900	9,621,700	1,903,900
1880	165,024,000	5,520,800	21,451,800	40,314,500	6,128,200
1890	235,362,000	12,332,500	45,852,600	69,649,500	12,049,700
1900	288,531,000	11,902,400	46,027,100	75,028,100	11,660,100
1910	433,263,000	24,569,000	64,399,000	174,099,000	24,572,500
1915	470,077,000	28,267,000	65,885,000	207,447,000	
	Real Estate exclusive of improvements				
1900	190,457,000	8,503,000	32,130,000	47,856,000	8,777,850
1901	192,447,200	8,554,000			
1902	191,804,500	8,633,000	31,894,500	50,006,000	
1903	201,508,000	9,970,000			
1904	293,500,000	10,360,000	33,657,000	56,516,000	
1905	304,136,185	10,917,000			
1906	237,083,000	11,981,000	35,199,500	61,526,500	
1907	260,689,800	15,322,000			
1908	258,651,000	16,542,000	37,620,500	106,901,500	
1909	283,169,000	17,256,500	42,285,000	120,278,000	
1910	288,095,452	17,413,000	44,478,000	110,964,000	
1911	288,653,700	19,020,000	42,969,000	110,309,000	19,669,300
1912	323,715,060	19,293,000	42,877,000	131,675,000	17,217,000
1913	326,305,105	19,600,000			
1914	326,057,234	19,979,220	43,041,000	146,022,000	
1915	327,409,000				

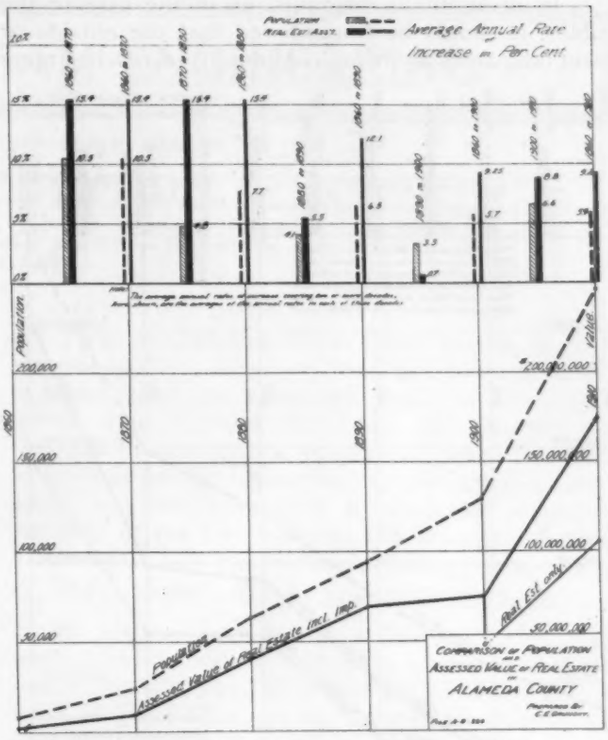

Average Annual Rate of Increase in Per Cent.
Population
Assessed Value of Real Estate incl. Imp.
Real Est. only
Comparison of Population and Assessed Value of Real Estate in Alameda County

Chart showing comparison of the growth of population with the assessed value of real estate in Alameda County

TABLE 5

Comparison of the Rate of Population Growth with the rate of increase of the Valuation of Real Estate for taxation purposes
San Francisco Bay Counties

Average increase per year in percentage

Period	San Francisco		San Mateo		Santa Clara		Alameda		Cont. Costa	
	Popul.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.	Pop.	Tax Val.
1860-70	10.0	11.6	7.5	4.5	8.2	13.0	10.5	15.4	4.8	6.1
1870-80	4.5	8.2	2.7	13.7	2.9	9.4	4.8	15.4	4.0	12.4
1880-90	2.5	3.6	1.5	8.3	3.2	6.5	4.1	5.5	0.8	7.0
1890-00	1.4	2.1	1.8	—0.3	2.3	0	3.3	0.7	3.0	—0.3
1900-10	2.0	4.2	8.2	7.5	3.3	3.3	6.6	8.8	5.8	7.7
1870-80	4.5	8.2	2.7	13.7	2.9	9.4	4.8	15.4	4.0	12.4
1870-90	3.5	5.9	2.1	11.0	3.0	7.9	4.4	10.4	2.4	9.7
1870-00	2.8	4.6	2.0	7.2	2.8	5.3	4.1	7.2	2.6	6.4
1870-10	2.6	4.5	3.5	7.3	2.9	4.8	4.7	7.6	3.4	6.7
1880-90	2.5	3.6	1.5	8.3	3.2	6.5	4.1	5.5	0.8	7.0
1880-00	2.0	2.8	1.6	4.0	2.7	3.2	3.7	3.1	1.9	3.3
1880-10	2.0	3.3	4.5	5.2	2.9	3.2	4.7	5.0	3.2	4.8

The valuations in the foregoing tables cover all the real estate in each county. A more rapid increase of value at the population centers was suspected than throughout the farming and grazing districts of the several counties. To obtain some light on the question of whether outside lands, lands not within incorporated areas, were increasing at the average county rate, the values of farm lands as reported by the U. S census were examined.

These values bear out the conclusion that the value of outside real estate too is increasing with increasing population and generally at a slightly higher rate. Without including in this statement the actual figures of farm land values as they appear in the census reports, attention is called to the diagrams 1 to 6 on which these farm land values for the counties San Mateo, Santa Clara, Alameda and Contra Costa, and rates at which their value is increasing are shown in comparison with similar information relating to population and the taxation value of all real estate and improvements.

In using these diagrams, as in the case of the tables, it should be remembered that the outside or farm land areas are being continually encroached upon

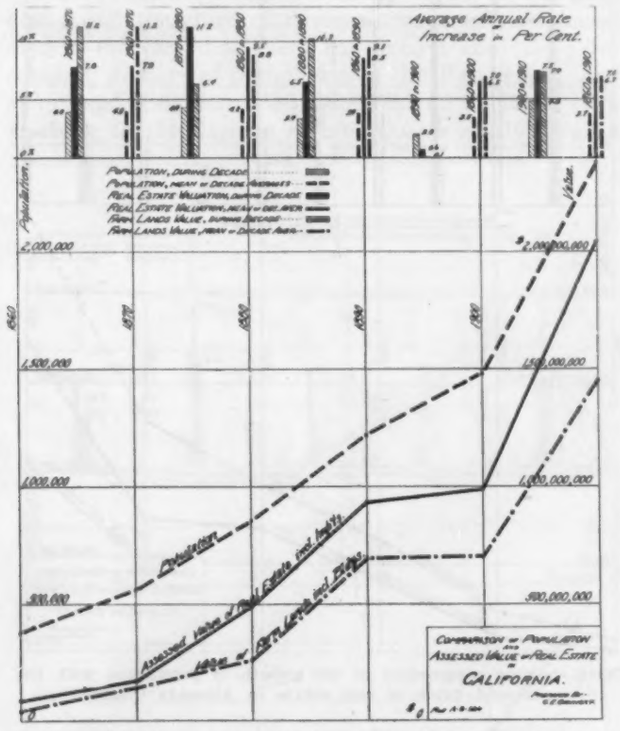

Average Annual Rate of Increase in Per Cent.
Population
Assessed Value of Real Estate and Improvements
Assessed Value of Real Estate and Improvements
Comparison of Population and Assessed Value of Real Estate in California.

Chart showing comparison of the growth of population with the assessed value of real estate in the state of California

by cities and towns. The acre property nearest to the population centers and therefore the most valuable of the outside land may in the interval between two of the years for which aggregate value is noted have been subdivided into lots and made a part of some municipality. If such areas could have been included in the comparison of outside land valuations, the rates of increase in valuation would no doubt appear slightly higher than shown in the tables and diagrams.

The taxation value of real estate and improvements in California as obtained from the published reports of the State Controller are presented in Table A.

TABLE A

California

Assessed Valuation of Real Estate and Improvements From Reports of the State Controller

Year	Assessed Valuation	Increase Per Cent in preceding 10 yrs.	Increase Percentage per Year during preceding 10 yrs.	Decade Aver. since 1860	Decade Aver. since 1870	Decade Aver. since 1880
1850	42,702,000					
1860	79,820,000	87.	6.5			
1860	79,824,000	87.	6.5			
1870	169,537,000	112.	7.8	7.8		
1880	491,885,000	190.	11.2	9.5	11.2	
1890	931,648,000	89.	6.5	8.5	8.8	6.5
1900	988,984,000	6.	0.6	6.5	6.1	3.5
1910	2,038,650,000	106.	7.5	6.7	6.4	4.8
1916						

The cash value of farm lands, including buildings, has been estimated and is reported upon in the U. S. census publications. From these the values presented in Table B for the farm lands of California were compiled.

With information at command relating to the rates at which the value of real estate is advancing, some consideration will naturally be given to cost,

TABLE B

State of California

Cash Value of Farms, Including Buildings From U. S. Census Reports

Year	Value of Farms incl. Bldgs.	Increase Per Cent in preceding 10 yrs.	Increase, Percentage per year during preceding 10 yrs.	Decade Aver. since 1860	Decade Aver. since 1870	Decade Aver. since 1880
1860	48,726,804					
1870	141,240,028	190.	11.2	11.2		
1880	262,051,282	85.	6.4	8.8	6.4	
1890	697,116,630	166.	10.3	9.3	8.3	10.3
1900	707,912,960	1.4	0.1	7.0	5.6	5.2
1910	1,450,601,488	105.	7.4	7.0	6.0	5.0
	Land only					
1900	630,444,960					
1910	1,317,195,448	109.	7.7			

when reservoir lands are to be valued as a basis for fixing the rates to be charged by any public utility whose business involves the use of reservoirs. Such consideration is all the more important because of the difficulty of bringing the various factors affecting value of reservoir land into any satisfactory relation to its value. In analyzing cost it is necessary not only to ascertain the original actual cost, but also the time of the acquisition of the property. If this be not too remote the cost data, with proper allowance for appreciation, like any sales of similar lands, may be used as an index, more or less dependable of present value.

It should be remarked in passing that the decision of the courts, that value should be used as a basis for rate regulation, are followed in this discussion, a view to which the writer takes exception, as explained in other articles of this series, and that in this discussion land value as an increment of the rate-base is, therefore, considered to be determined just as value would be determined in condemnation proceedings.

ELECTRIC POWER DEVELOPMENT IN UTAH

BY W. R. PUTNAM

The availability during recent years of economical electric power for the factories of Utah has played a most important part in the development of the state's manufacturing establishments and the utilization of Utah's natural resources.

Less than five years ago a score or more of small electric companies each acting individually, were trying their level best to generate and distribute sufficient electrical energy to meet a rapidly growing demand for economical and dependable electric power in this section of the intermountain west.

The welding together of the generating and distributing plants of these small concerns and the creation and development of a modern and unified system of hydroelectric power plants capable of supplying the homes and factories, stores and mines and mills throughout northern and central Utah and western Colorado, forms one of the most important factors in the recent history in the development of the intermountain west and the utilization of natural resources throughout this great stretch of territory.

For twelve months ended July, 1917, the Utah Power & Light Company expended for construction and operating wages only, in the territories served, $2,399,062. Sixty-one thousand customers were served.

There is no more interesting phase of the company's operations than the important factor of its work among Utah manufacturers.

Practically every large manufacturing institution in the state today is electrically operated.

FUEL OIL AND STEAM ENGINEERING

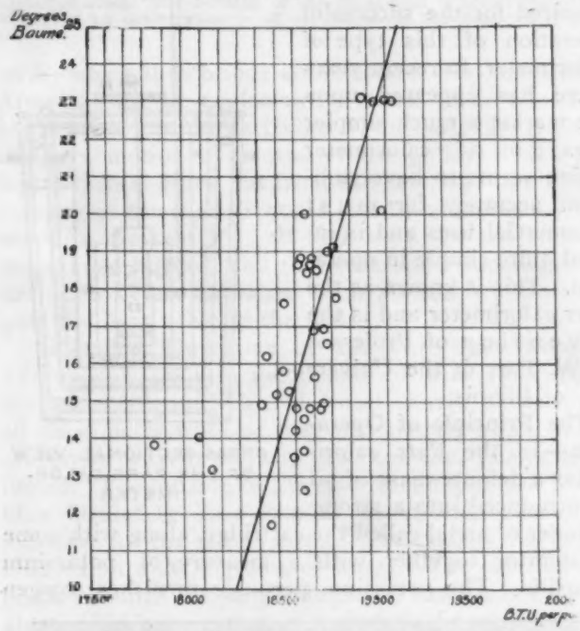
BY ROBERT SIBLEY AND CHAS. H. DELANY

(The exact measurement of the heating value of oils is a matter of prime importance in fuel oil and steam engineering practice. In this article the authors first establish mathematical formulas for computation of the heating value of oil when the chemical analysis is known. A description of the use of the fuel oil calorimeter follows which brings in a detailed illustration of how the computation is made when the calorimeter test has been performed.—The Editor.)

DETERMINATION OF HEATING VALUE OF OILS

To determine the efficiency of boiler operation it is necessary to know the heat producing value of the oil used in firing. Again, since oil is usually sold commercially by the barrel, the heat producing value of the product must be known in order that the engineer may ascertain the economic value the product may prove to his client in its use in the power plant for the generation of steam.

An Approximate Method Based on the Baume Scale.—The heat producing value of oil is usually expressed in the number of heat units per unit of mass that the oil will give out when it is completely burned in a furnace. In engineering practice this is usually expressed in B.t.u. per pound of oil so burned.



THE GRAPHIC LAW FOR CALORIFIC VALUE OF FUELS

In this illustration is shown how a large number of experimental values often enable the engineer to ascertain an empirical law for setting forth experimental data. By plotting the heat determinations for fuel oil against their gravity expressed in Baume readings, the experimenter deduced an equation for determining the calorific value of water free oil when its gravity Baume is known.

There are various methods of ascertaining this value. An approximate method is that based upon the gravity of the oil. To establish this method a large number of samples, in which the gravities of the oil free from moisture were expressed in Baume readings, were accurately determined as to their heating value. These values were plotted on a chart and it was found that the following relationship is approximately true in which H represents the heat units in B.t.u. liberated per pound of fuel burned.

$$H = 17680 + 60\ B \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (1)$$

Thus in analyzing a composite sample of forty samples of Kern River oil, the United States Bureau of Mines found that its calorific value was 18562 B.t.u. per lb. of oil, in which the oil had .5% moisture, and that the Baume reading of this oil when free from water was 14°.78. According to the formula above, which was first announced by Professor Joseph N. LeConte of the University of California, the heating value of this oil when free from moisture shou'd be

$$H = 17680 + 60 \times 14.78 = 18{,}566 \text{ B.t.u. per lb.}$$

In this instance then it is seen that this approximate method checks with considerable accuracy, since the water-free oil showed by actual test to have a heating value of 18,658 B.t.u. per lb. In the utilization of this formula, however, it must be remembered that the oil must be taken as anhydrous, or in other words that the oil sample is moisture free.

Dulong's Formula Based on the Ultimate Analysis.—The second method of arriving at the calorific value of crude petroleum is by means of Dulong's formula. This formula is based upon the ultimate analysis of the oil in which the heat value of carbon, hydrogen, and sulphur are taken into account.

In the burning with oxygen of one pound of carbon, one pound of hydrogen, and one pound of sulphur it has been established experimentally that 14600, 62000, and 4000 B.t.u. of heat energy are respectively given out. Hence it is evident that if a one-pound sample of fuel oil has C proportions by weight of carbon, H proportions of weight of hydrogen and S proportions by weight of sulphur, the total heat given out by the one-pound sample will be

$$H = 14{,}600\ C + 62{,}000\ H + 4000\ S$$

In the chemical analysis of fuels a certain amount of oxygen (O) is always encountered. This of course kills, as it were, its combining weight of hydrogen. Since oxygen unites with one-eighth of its weight of hydrogen, the net hydrogen available for heat generating purpose is $(H - \frac{O}{8})$.

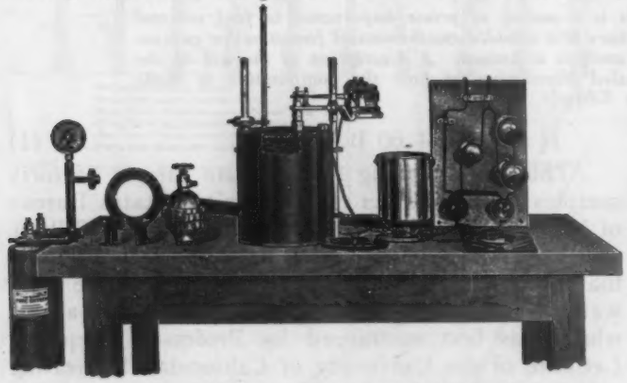
Hence we have Dulong's formula

$$H = 14{,}600\ C + 62{,}000\ (H - \frac{O}{8}) + 4000\ S \ldots . (2)$$

For California oils, Dulong's formula seems to indicate a heat value per pound of about 5% in excess of the true value. In other words, it indicates a heating value of about 19,500 B.t.u. per lb. of California crude oil, while a great number of calorific tests have

shown that the average value is about 18,500 B.t.u. per lb.

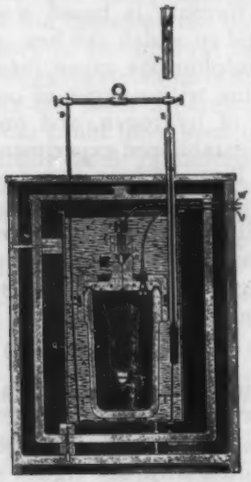
The Fuel Calorimeter. — The most accurate method of determining the heating value of a sample of oil is by the employment of some form of calorimeter, wherein a sample of definite mass is burned



THE EMERSON FUEL CALORIMETER

In this type of calorimeter the fuel sample is placed in the bomb, the bomb inverted, as shown in the sketch, and filled with oxygen which is accomplished by means of the spindle valve at the top of the bomb. After filling the calorimeter with distilled water and firing the sample by means of an electric circuit, the rise in temperature of the water in the calorimeter is ascertained, and the calorific value of the fuel thus determined.

and the heat given out ascertained. The fuel calorimeter is an entirely different instrument from the steam calorimeter used for measuring the moisture of steam, which was described in an earlier chapter. The fuel calorimeter is a true instrument for measuring heat, as its name implies. Calorimeters in general may be divided into two classes, the one known as the



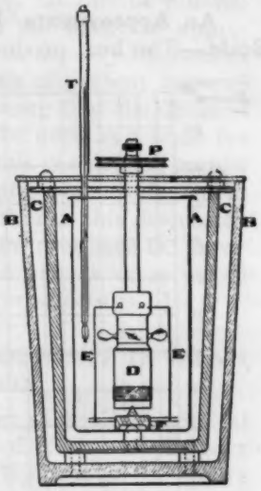
THE ATWATER-MAHLER BOMB CALORIMETER

This type of calorimeter is applicable to the highest scientific work. It permits of determining the exact amount of water and carbon dioxide in the products of combustion, thus enabling the error due to the condensation of the water in the bomb to be overcome and therefore making it possible to calculate the exact amount of heat the fuel should produce under boiler conditions.

continuous method and the other as the discontinuous method. In the former instance a sample is continually burned, and the average results ascertained over a considerable period. This method is only applicable for gases and some unusual types of oils. The discontinuous process is on the other hand the most advantageous for the determination of the heating value of crude petroleum.

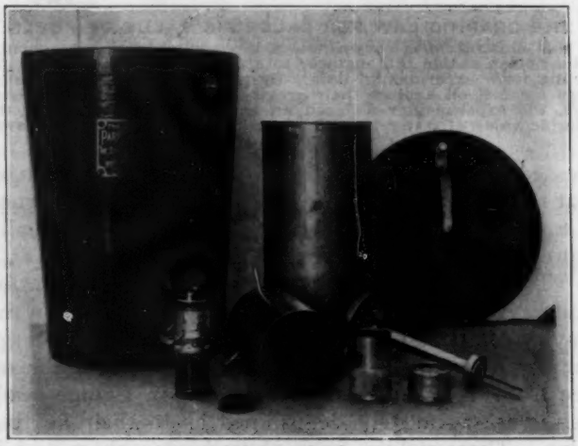
Several methods are employed in the application of the discontinuous calorimeter. Most forms of such calorimeters consist essentially of a strong combustion chamber with a crucible for holding the sample; valves for charging the chamber with oxygen in order to properly burn the sample; a method of igniting the sample; and a vessel of water in which the bomb or explosion chamber is immersed in order that the resultant heat may be absorbed by this water and thus carefully measured. This latter vessel is usually situated in a second compartment which serves as a jacket. The main principle upon which such calorimeters depend is based upon the fact that the burning of carbon, hydrogen, and sulphur with an artificial supply of oxygen presents the most accurate method of liberating the latent heat in the fuel and the ascertaining of its quantitative proportions. Types of this calorimeter familiar in the market are known as the Mahler, the Hempel, the Atwater, the Emerson, and the Carpenter.

The Parr Calorimeter.—In the commercial determination of the heating value of crude petroleum, however, it is often inconvenient to secure oxygen under the proper pressure required for the successful operation of this type of calorimeter. In recent years there has appeared upon the market a much simpler design of calorimeter which seems to have sufficient accuracy for most commercial uses and is indeed quite simple in operation. This is known as the Parr calorimeter and is the invention of Professor S. W. Parr of the University of Illinois.



CROSS-SECTIONAL VIEW OF THE PARR CALORIMETER

The Principle of Operation.—In the Parr calorimeter a definite mass of oil is introduced into a strong cylinder of metal called the cartridge, along with some accelerator together with a measure of potassium peroxide. The potassium peroxide furnishes oxygen

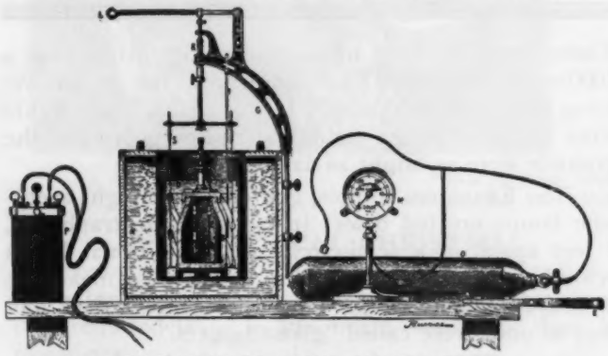


THE PARR CALORIMETER UNASSEMBLED

In this type of calorimeter a carefully weighed oil sample is burned with a chemical agent without the use of free oxygen. The ease with which it may be manipulated commends its use for commercial application. For scientific work, however, a type of the Bomb calorimeter is to be preferred.

for combustion and the accelerator, which is usually potassium chloride, insures that all the fuel may be burned. The ignition is effected electrically by the burning out of a fine iron wire immersed in the mixture.

As shown in the illustration, the cartridge D, in which the sample is placed, is closed up, inserted into a can of water A, and the whole placed in a fibre ves-



THE MAHLER BOMB CALORIMETER

This type of calorimeter represents one of the most accurate for the determination of the calorific value of fuel oil. The bomb is of enameled steel. The burning of the oil sample is accomplished by supplying an outside source of oxygen as in the Emerson Calorimeter.

sel B, which thus brings about careful heat insulation. After causing an explosion by means of an electrical contact spark in the cartridge D, the cartridge is given a rotary motion by means of the pulley P and the heat which is given out from the cartridge due to the burning of the ingredients is rapidly absorbed by the water in the vessel A. If then we know the mass of the sample burned, and the mass and temperature of the water before and after the explosion, we can compute the heat value of the fuel.

Detailed Operation of the Parr Calorimeter.— Let us now go into the details of this calorimeter operation. A well lighted closet should be used for all calorimeter work so that air currents which might otherwise prevent uniform radiation can thus be eliminated. The outside of the calorimeter cup and of the fibre insulating case should be entirely free from moisture for the same reason. The calorimeter cup A is filled with 2000 grams of water. The cartridge or bomb in which the sample is placed has a water equivalent of 135 grams; that is, it absorbs the same amount of heat as 135 grams of water would under the same range of temperature. Hence, the total water equivalent W_e is 2135 grams. As the mass of oil is also determined in grams, the water equivalent W_e divided by the mass of oil fired, W_o, becomes an abstract ratio, and, if this ratio is multiplied by the rise in temperature of the water in degrees Fahrenheit, the result is heat units per pound of oil, or, if the temperature is expressed in degrees Centigrade, the result becomes calories per gram.

The water is best measured in a 2000 c.c. flask. About 2003 c.c. of water are used instead of an exact 2000 c.c., since the specific gravity of water at ordinary room temperatures is slightly less than unity and this increased volume is necessary to measure weights volumetrically.

The thermometer which is employed in temperature measurements has a range of from 65°F. to 90°F. and is standardized by the Bureau of Standards at Washington. Graduation errors are known to within .01°F. The thermometer scale is divided to .05° and with care may be read to .005°. The greatest chance for error in fuel calorimeters is in reading temperatures, since it is difficult to avoid parallax. Consequently as the rise in temperature seldom exceeds 5°, an error of .01° is equivalent to .2% error in the work.

Preliminary Precautions. — Before placing the sample, the cartridge should be wiped clean and dry, as moisture will condense on it if it has been standing for some time. The top and bottom pieces, as well as the gaskets and electrical terminals, should be dry, since the moisture on them takes part in the chemical reaction and thus introduces considerable error. The cartridge should be tightly assembled, and 1.500 grams of accelerator (potassium chloride), weighed to the nearest reading of .005 grams, placed therein. The oil is weighed in a small flask with an eye dropper and about .04 to .05 grams (8 to 12 drops) dropped into the cartridge upon the accelerator which absorbs the oil. Upon reweighing the flask of oil and the dropper, the net weight of the oil sample is at once obtained. A measure full of sodium peroxide is added and the contents thoroughly mixed with a stiff wire. With care no oil and very little peroxide will adhere to the wire. The sodium peroxide should be supplied by the calorimeter manufacturer, as inferior grades are apt to supply variable and detrimental products of combustion.

About 3 in. of No. 4 iron wire for firing the charge are next looped on the firing terminals and tested out to insure a good electrical contact. The firing current is usually supplied by a few dry cells or from a storage battery.

The stem of the bomb is next fastened in place and the vanes attached. The cartridge is placed in the calorimeter cup, the cover and pulley attached, and the cartridge stirred by a small motor for about five minutes. The motor may be of the toy variety and is usually placed in the lighting circuit with a lamp resistance. The electric circuit is controlled with a two-throw switch so that the motor may be cut in and out without interfering with the illumination in the closet. The motor speed should be as nearly constant as possible, since a variable speed will cause a variable rate of radiation from the calorimeter. The rotating bomb should have from 100 to 150 revolutions per minute.

The Explosion of the Charge and the Taking of Temperatures.—The thermometer is next placed into the water bath through a hole in the cover and should be supported so that it does not touch the metal cup which contains the water. After a steady initial temperature has been reached, the firing circuit is completed through the pulley, and the resulting temperatures read every minute for the succeeding ten minutes, in order to ascertain the correction to be made for uniform radiation. This series of readings is taken in order to ascertain the law of radiation and then to make a proper correction for the error involved.

Thus, for a period of about five minutes the temperature will rise until a maximum is reached, after which it will begin to fall. The radiation during the first five minutes is assumed to be at the same rate as that observed during the entire radiation period.

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

TRAPSHOOTING BY ELECTRIC LIGHTS

(The good marksmanship of our army is attributed to the familiarity with the gun possessed by so many Americans. The prolonging of the hours in which that marksmanship may be practiced by the proper illumination of ranges and targets is therefore, not only adding a further interest to the sport, but performing a patriotic service. Is the gun club in your city properly fitted out for night time practice?—The Editor.)

AN AUTOMATIC TRAP
The targets are sprung from a trap house, by an automatic trap or a hand trap.

TRAPSHOOTING by electric light is the latest dish to be added to the sporting menu.

Golf, tennis, baseball and track athletics—from sprinting to marathon races—have been tried under the powerful rays of the calcium without adding anything to their popularity; yet there are those who believe that trapshooting is destined to become a more important factor in the world of sport through the medium of artificial light.

There are many who find it an extremely difficult task to shatter the clay targets with daylight in abundance; and these people, quite naturally, will not star or become famous through their efforts under electric light. No matter how good the lighting system may be it won't come up to the quality of light furnished in the daytime—every day.

During the past few months quite a number of these trapshooting tournaments after nightfall, under electric light, have been held, and every one has been successful. On Venice Pier, Los Angeles, Cal., more than 100,000 targets were thrown in two months. Here the shooting was done with 20-gauge guns. The only criticism at Venice was that there wasn't room enough for all those who desired to shoot.

The first shoot ever held under the calcium lights was conducted by the Jacksonville, Ill., gun club several years ago, and then the Salem, N. J., yacht and gun club introduced the sport in the east. Around Salem way, Illinois is considered in the west, but in what is really the west, Illinois is considered in the east.

Anyway, Salem had a corking shoot. They had lights over and behind the shooters, lights on the side of the traphouse which threw rays outward and upward; two stereopticon lights 16 yards behind the shooters and 12 feet high, one light being thrown above the other so that a greater area of space could be covered. Every target was visible until it fell.

The Chicago, Illinois, gun club staged an electric light carnival which was considered just the thing. There were six flood lights, each lamp fitted with a 1000-watt tungsten. Each lamp projected an unwavering light over 8800 square feet of space. These lights were mounted on the clubhouse and pergolas, and the grounds were as bright as day.

The Evanston, Illinois, gun club used eight acetylene lamps erected 6 feet in front of the traphouse, 2 feet apart, in a semi-circle, with additional lights behind and over the shooters' heads. To make the targets even more visible they were whitewashed, and they at once were called "ghost targets."

Other cities that have tried trapshooting under electric light, and liked the sport are Clarksville, Ia., Portland, Ore., Newark, Cal., and Yorklyn, Del.

In some places where the lighting facilities are not of the latest improved type it is necessary that one be a snapshooter in order to "bust" the targets. It is a sport where "he who hesitates is lost."

TRAP SHOOTING FROM A PIER
This particular scene is in New York, but a similar position on the Venice Pier at Los Angeles has provided very satisfactory night shooting when properly illuminated.

It is obvious that in order to obtain good results in the shooting, the gunsights as well as the targets must be properly lighted. For this reason the problem is not simply one of turning a searchlight or two in the direction of the traps. The factor of expense enters into the question of flood lighting and in the interests of economy various ingenious schemes for placing the lights have been worked out.

In view of the fact that practically every city of any size in the west has at least one gun club and that besides the daily practice, the ranges are used for annual district and national meets, it seems as though there might well be a field here for the spreading use of electricity.

"SANTA AND THE WONDERFUL GENIE"
Scenes from the advertising film under that title

AN ELECTRICAL CHRISTMAS

Some years ago, Thomas Edison predicted that it wouldn't be very long before practically everything that required labor in the home would be done by electricity.

Every one knows to what extent labor, time and money saving electrical appliances have been introduced into the home, and how energetically and successfully central stations, electric shops, contractors and others have been promoting the use of such devices. But it has been only with the sudden descent of war upon this country that the full meaning of Edison's words, and their great portent comes to us.

Apropos of this question of selling electrical appliances, this year's campaign of The Society for Electrical Development, "America's Electrical Christmas" comes along at a most opportune time. Never before in the history of the industry was there a time when electrical merchandise played the part it will this year. Nor was the time ever more propitious for the electrical dealer than this season. The sale of electric appliances is not only the best thing the merchant can do for more business—and more profits—it is practically the only thing.

These facts, and others, have all received the most careful attention in a book just published by the Society, which is being sent gratis to members and non-members alike, upon request. It is designed for Central Stations and dealers who have arrived, those who are Already There, those who are Going, and the Just Started. It is a big book, 48 pages and cover, and is attractively printed in many colors, profusely illustrated throughout, and filled with practical, timely suggestions, built for stores of all sizes in cities of all sizes.

The book has some twenty chapters, treating on everything from the store and window display, to the use of two very excellent movie films which the Society has prepared, in co-operation with the Universal Film Manufacturing Company. "Santa and the Wonderful Genie" and "The Home that Runs by Magic" are titles to appeal to any audience. The motion picture is a super-salesman. It reaches more people than any other medium in the world—and reaches them when they are in a relaxed and receptive mood. A message in the tion picture is a super-salesman. It movies will be seen and understood. There is room on each film for your own name and business trade mark—and you will find that your local theatre will run the films at small cost. All the helps, copy, cuts, etc., are furnished practically free to members and non-members along the same broad liberal policy heretofore manifest in such previous campaigns as America's Electrical Week, Electrical Prosperity Week, Wire-Your-Home-Time, etc. Readers are advised to correspond with The Society for Electrical Development for full information and aid.

"THE HOUSE THAT RUNS BY MAGIC"
A moving picture to show your customers the electrical devices in actual use

THE JOBBER'S STANDPOINT

BY J. I. COLWELL

(Every branch of the electrical industry has its legitimate place—manufacturer, jobber and contractor-dealer. This offer of co-operation and suggestion of definite avenues of helpfulness came from the Seattle manager of the Western Electric Company at the recent convention of Oregon Contractor-Dealers at Eugene.—The Editor.)

The electrical jobbers have spent a great deal of time and money fostering co-operation. After the jobbers had built up their own association they discovered that in order to secure the best results for the entire industry they must help organize the contractors and dealers. The jobber believes in the distribution of his goods through the contractor-dealer to the consumer and has no intention of jumping over his head and distributing the goods direct.

There are of course, always some elements in the electrical business who do not seem to work with the other branches of the industry, or along broad lines, and who operate on the day-to-day policy, having in mind only the immediate dollar which they can secure from their business. In this class are some distributors who sell material of an inferior make at a price lower than they can afford to sell, if they really knew their costs, and they occasionally secure and sell small quantities of standard material at practically their cost. They supply principally the irresponsible contractor who has had but little practical, and no business experience, does not know how to accurately figure his cost on a job, is satisfied with a profit equal to the wages of one of his wiremen, and is constantly undermining the business of the responsible contractor who has had enough practical and business experience to estimate work so as to make a fair profit on it. That kind of a distributor of electrical material is manifestly inimical to the success of the responsible contractor, for he supplies ammunition to the irresponsible contractor to fight you with.

The responsible jobber should not, and does not, encourage the ultimate consumer to do his own electrical wiring or installation work, and adherence to that policy will check any tendency to disorganize the present contractors' business. There are, however, large plants, maintaining an electric engineer with a large amount of constant maintenance work who will not suffer the inconvenience of having outside concerns take care of their electrical equipment, and when they are big enough to buy supplies in quantities about the same size as the electrical contractor they will doubtless deal with the jobber, and many of them when purchasing large apparatus are averse to recognizing even the jobber's right to a profit.

The electrical material purchased by a few large industrial plants enters into their product (varying all the way from a ship to a motor-driven ice cream freezer), which they manufacture for sale, and this class of industrial is entitled to as good a price consideration from the jobber as a contractor. Just as some large central stations in the maintenance of their plant seek to obtain their power equipment direct from the manufacturer.

There are, however, manufacturing industries which have suddenly come into existence that use electrical material in their product, and because of their lack of organization, offer opportunity for the electrical contractor for construction and wiring work. About all a jobber can do in a case of this kind, where he finds the contractors trying for the electrical work, is to exert his efforts in any way that he can to help them get the job.

This is really the first generation of electrical contractors in the Pacific Northwest, and the majority of them have not even inherited a bookkeeping system or cost system, because they did not, in most instances, purchase the business, but started it themselves after a few years of experience as a foreman for some other contractor, or after being in the employ of a central station.

When this is considered, the men in the electrical contracting business are really to be congratulated that their business is in as good shape, and on as high a plane, as it is.

There is no question as to the recognized standing of the contractor-dealer as the proper channel for the distribution of the electrical supplies to the consumer, and even though this position is a comparatively new one, it is a permanent one and should be an independent one. The electrical contractor undoubtedly aims to be a business man running his own business and independent of a jobber or manufacturer, in securing his contracts, installation, or other business.

The jobber maintains a selling organization to actually sell the five thousand or more different items of electrical merchandise which he stocks, for regardless of the pleasing personality of the usual representative of the factory, knowledge of his line and other valuable technical information given by him to the trade on his occasional visits, those who buy or are in the market for electrical material go to the jobber for the information as to what they need, because of his experience in the electrical business.

The manufacturer or his representative has a big job to perform if he makes sure that the sales manager and the salesmen of the jobbing houses that sell his goods actually know his material, what kind of work it is particularly fitted for and everything there is to know about its construction and uses. Any jobber is willing to give the representative of the manufacturer all the time he will use in this kind of work with his salesmen.

This method of thoroughly establishing their lines with the jobber is not followed out by many manufacturers, but is one way in which the manufacturers and jobbers can work together to their mutual advantage and to the advantage of the industry. This is really educational work, but business and technical education seem to be greatly needed in the electrical industry. A realization of that must have been in the minds of the leading electrical men of the country when they founded the Society for Electrical Development which backed and promoted "Electrical Prosperity Week" and "America's Electrical Week."

It has been said that these campaigns to educate the public have developed business principally for the central stations. This may have seemed true at first glance, but when the public wants additional electrical appliances and equipment, the central station wants the contractor to do the additional electrical wiring, and he wants to use the jobber's stocks of appliances and other material.

We can all well afford to co-operate with the central stations in educating the public to a better realization of what electric conveniences are available, and a more thorough knowledge of the practical application of electricity. Advertising is, of course, accomplishing very much in this education, and is constantly developing business for all of us. An example of the educational and co-operative work being done by the Society for Electrical Development is shown in their pamphlet entitled "Why You Should Patronize a Responsible Contractor." This lines up in a series of effective advertisements the good reasons why the public should patronize a responsible contractor. It could be used to advantage either as individual advertising, by a contractor-dealer, or by all the responsible contractors in a town, sharing the expense and all having their names run underneath the advertising copy.

The co-operation of the different branches of the electrical industry has not only brought about the transfer from jobber to contractor of the distribution of electrical supplies to the consumer, but the wiring of residences and buildings, the running in of the service for electric ranges, installation of motors, and in some places, the selling of lamps is now recognized throughout the country as contractor-dealer business. When a demand is created for new electrical devices and when a permanent market is assured for them, we believe that the central station is willing and aims to discontinue the sale of them, provided the contractor-dealer is properly equipped and situated to serve the public, so that all of these devices which the public are willing to buy will reach their lines and consume their current. We do not believe that the market for the electric range has been sufficiently developed, or the demand for it sufficiently popularized, or that the contractor-dealer has an organization adequate to push the sale of it and properly follow it up after the sale, for the central station to turn over its distribution to the contractor-dealer; but is not the contractor-dealer equipped to handle the sale of lamps and would not the central station be better off if they were not bothered with the warehousing and distribution of lamps?

There are, I suppose, many instances where the contractor looks over the plans of a home or apartment house with the owner and does not find any base board outlets, or floor outlets to connect portable lamps, percolators, toasters, warming pads, irons, air heaters, and other household necessities, or he does not find that it is planned to wire the kitchen for an electric range. Electrical appliances have a great deal to do with the convenience and attractiveness of a house or apartment, and owners are susceptible to arguments for additional electrical equipment, and if you handle the matter properly, not only the size of the contract will be increased, but you will most likely also sell the devices for which the extra outlets are made. This is also good co-operation with the central station, jobber and manufacturer.

We all need the support of the central station in our problems, just as he needs the loyalty of every man in the electrical business. His success means our success, and every wireman, contractor, jobber and manufacturer should go out of his way to boost for, and defend, the central stations, both in helping them get more of a load on their lines, and in being sure that their side, provided it is fair and reasonable, of any public controversy is well understood.

There can be no doubt about the proper growth of the industry if the different branches of it co-operate consistently with each other, and we all have for our motto "The fair treatment and proper serving of the consumer."

THE MODERN ELECTRICAL CONTRACTOR-DEALER

BY W. M. DEMING

The successful electrical contractor or dealer of the future must be master of his craft. He must be able to advise and suggest new ideas and be up to date in every respect for—other things being equal—the business will come to the one who can offer the best suggestions and give the best service.

He will profit materially by cultivating the friendship and seeking the advice of the local lighting and power company's representatives; also don't overlook the salesman on the road, for often valuable ideas and suggestions come from the most unexpected sources and it all tends to build up a spirit of reciprocation—which is still another way of saying co-operation.

Again, a dealer who purchases and sells only what his trade calls for is a dead one. He must carry staples, of course, but he should always be on the alert for new ideas that will attract the public.

Just a word about the contractor-dealer who keeps his place of business looking like a junk shop, all sorts of odds and ends scattered about, office and show rooms untidy, etc. Consider the lighting company's office and show rooms or your competitor's neat and tidy place of business. To which would ladies or business men go first?

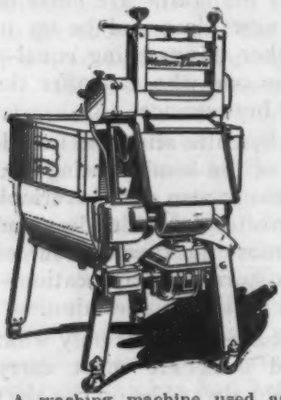
I am satisfied that price does not occupy an important place in the selling game. Salesmanship is, in fact, destroyed just in proportion as the question of price figures into the bargain. Furthermore the reputation—the good name and the success of a business concern—is as much or more in the hands of its employees who come into direct contact with the buying public as it is with the owners or executives. The customer offended by an employee is offended at the company. On the other hand the customer pleased and satisfied with an employee's treatment is a friend and boosts for the company. It is, therefore, just as important that employees be trained to render proper service as it is for the heads of a business to give efficient service. Train them to keep their eyes, ears and minds open for new ideas and prospective business.

Just another thought. The right hand of salesmanship is advertising, either through personal suggestion or in the newspapers. No better opportunity for building up your business exists today, but it must be done properly. To sell many items that you handle successfully it is first necessary to create the desire for that thing in the minds of the public. In other words, you must first sell the idea. You can therefore devote much time to a study of effective advertising. The assistance of your local lighting company is of great value in this respect.

Western Ideas

(From time to time the Journal of Electricity plans to note new window ideas, good store features, selling schemes—in fact anything which is 'done better' by some one in the West. Is your store not represented in these columns because you haven't any ideas—or because you have failed to report them?—The Editor.)

AT THE CALIFORNIA STATE FAIR the exhibit of C. Hobrecht of Sacramento successfully combined the advertising of lamps and washing machines and by its originality attracted attention to his further display of electric wares. He offered a handsome portable lamp for raffle, 5,000 tickets being given out in all. The lamp as displayed attractively in his show window attracted considerable attention in the first place and on the day of the drawing, crowds gathered about the place long before the scheduled time. In place of the usual raffle wheel, an electric washing machine was used to thoroughly mix the tickets, current being turned on for about five minutes. The spectators in the meanwhile interestedly noted the operation of the washer. A disinterested person then drew the ticket indicating the winner.



A washing machine used as a ticket chopper

"ELECTRIC HEATERS SOLD HERE" is the impression which is driven home to every pedestrian who passes this shop. It is interesting to stand on the corner and watch them hurrying by. They bustle unconcernedly past florist windows, milliners' shops and bakers—but when they come to the electrical store, every one of them stops and looks—or at least

An advertisement you feel before you see

hesitates and turns his head. The idea is not an uncommon one but it is extremely effective. It consists of placing an electric heater in the front vestibule of the store with the current turned on and so focussed that it strikes the passerby with a breath of heat directly across his face. The surprise of this localized warmth causes him to look up and impresses him with how inconspicuous and yet effective an electric heater can be. There is some trick of properly focussing the heat which makes certain exhibits of this kind more effective than others—it must strike the passerby full in the face to really have its effect. The practice of leaving the heater on even after the store is shut up and deserted for the night is also very telling—the surprise of the wave of heat coming from a quiet shop, obviously undirected by human hands, is even greater, perhaps, than in the daytime.

THE TRADE MARK has long been acknowledged as a useful thing for a manufacturer's product or a publisher's sign—but E. E. Elzea of Fresno, California is finding it useful in his contractor-dealer's business as well. He has adopted the little red banner with the electric sparks as his mark and uses it for all occasions. It is printed on his business cards, it is

This trade mark is used on visiting cards, in the show windows and in advertising

run with his advertisements in the paper—it flashes across his show window. "The Electric Shop" on a red ribbon means always his shop—and the public becomes familiar with the fact of its existence.

Another excellent idea is utilized by this same contractor-dealer in his window displays. In one window a motor will be shown—in the other, all the accessories of that motor. Aside from the attractive arrangement and frequent changing of the window, the customer is not confused with a scattered impression, nor repelled by a litter of odds and ends. One window always plays up the other—the customer is given one idea and that pressed home.

THE VALUE OF A CONFERENCE in centralizing the efforts of their employees is being recognized by manufacturer and jobber alike. This recent gathering of Western Electric men from their San Francisco office to discuss pushing the farm lighting plants is typical of what can be done along that line—and should prove suggestive to the contractor-dealer of the possibilities open to him. Regular meetings of the store and construction staff to talk over policies,

A conference of Western Electric workers to discuss policies and methods—a practice which might well be adopted by contractor-dealers among their employees.

point out opportunities of increasing business and and explain the uses of some of the material which is passed on from the central station and manufacturer, should prove of untold worth. If he is going to make the most of the field open to him, if he is going to carry out new ideas and progressive methods, the contractor-dealer must have his employees with him, working out his ideas because they understand them, thinking along the same lines and even suggesting improvements here and there. You have often regretted, perhaps, that you had to pass anything over into other hands—that you could not do it all yourself. The best way of making your employee as much a booster of your business as yourself is to talk it over with him and let him feel himself part of a team working together—is, in fact, to hold a regular conference of your business staff.

SOME RECENT NOVELTIES of electricity have been gathered together by the Pacific Power & Light Company's Bulletin. Obviously, some are more practicable than others, but there may be an item or two here worth passing on to your customers:

Ten screws a minute may be driven in soft or even hard wood with the electric hand screw-driver.

Internal organs of soldiers may be photographed as easily as the skeleton with a new X-ray invention.

Electro-magnets are now widely used in holding pieces of metal while they are machined and polished.

Powerful electric sirens installed in Paris, France, will be used to warn citizens of the approach of Zeppelins.

"What will they invent next?" Well, a hustling Colorado surveyor has adapted Mazda lamps to his instruments to allow surveying at night.

Horseback riding at night has been made safer for both horse and rider by the invention of an electric headlight attached to Dobbin's bridle.

Miniature naval battles may be staged in an ordinary bath tub with a new electric towing apparatus for moving model battleships about in the water.

Locomotive engineers have discarded the smelly oil torch used for inspecting and oiling engines at night and now powerful electric flashlights are used.

Lives of linemen are protected against high tension live wires by an instrument no larger than a watch which indicates whether the wires are carrying current or not.

Electrically operated carriers are used in up-to-date newspaper offices to speed up the delivery of news from the copy desk to the composing room where it is put into type.

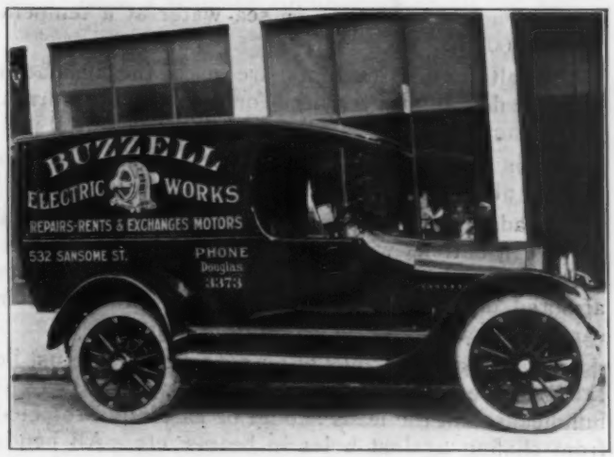
A new pocket lamp, which carries its own electric generating plant and requires no dry battery renewals, remains lighted as long as the dynamo is kept in motion by a lever operated by the thumb.

Static charges of electricity capable of igniting gasoline may be produced when gasoline is filtered through chamois or other insulating mediums in cold weather. The danger may be obviated by the use of metal gauze.

A safety feature which prevents the heat in an electric heating pad from rising to dangerous temperature is now used extensively; it consists in a fusible link is now used at a low temperature, thus automatically cutting off the supply of electricity.

Trees are "topped" with a charge of dynamite placed high among the branches and fired by electricity.

THE DELIVERY WAGON has been used as an advertising medium by bakery shops and moving vans and dyers and cleaners—I suppose the only reason some of us know of the existence of certain storage



A bill board that travels all over the city

houses is because of seeing their names on their huge wagons—but the idea up to now seems to have passed by most contractor-dealers. The value of a striking picture and an attractive sign for delivery wagons has, however, been fully appreciated by the Buzzell Electric Works of San Francisco in getting up their new delivery cars. The machine itself is most dignified and elegant and the effect of the motor and name in gold against the black is very pleasing. The machines have already attracted much favorable comment and are destined to spread in their advertising value.

WIRING RULES FOR FRENCH SHIPS

(All up and down the Pacific Coast, ships are being built as fast as they can be turned out. The wiring of these vessels must come under one of five rulings, according as they are intended for coastwise trade, United States wooden ships, for France or for England. In the issue of December 1, 1917, the Journal of Electricity published the rules which govern the wiring of the wooden ships now being built for the government. The following rules govern all wiring done on wooden and steel ships built for the French government.—The Editor.)

Bureau Veritas Rules on Electric Lighting

1. Dynamos to be of an approved type; continuous currents are to be preferred. The engine should be fitted with a governor, and situated in the engine room or in a separate adjacent compartment and efficiently ventilated.

2. The fittings on main switch board should be mounted on slate or other incombustible material, placed near the dynamos, and be accessible from the back if possible, unless all connections be established on the front of the switch board. From this main circuits should be led to auxiliary switch boards for distributing the current to the various branches, which may not be taken directly off a main cable.

A voltmeter for each installation, and an amperemeter for each dynamo, to be supplied.

3. Leads to of copper wire having a conductivity of at least 98%. Single wires should not be less than 20 S.W.G. with a total sectional area of at least 1 square inch per 1250 amperes. The insulation on the leads should be absolutely watertight, and be capable of bearing a temperature of 150° F. without being softened. All cables should have an insulation resistance of not less than 700 megohms per statute mile after 24 hours immersion in sea water at a temperature of 60° F.

If alternating currents are used the insulation must be double that required for a continuous current of the same voltage.

It is recommended to test the insulation of the electric plant before proceeding on a long voyage.

Leads should be accessible. In cabins they should be laid in battens with covers screwed on; where exposed to moisture they should be lead covered, and be armored or protected by galvanized iron casings in cargo holds or wherever liable to be injured.

Watertight packings of an approved type must be fitted where leads pass through decks or watertight bulkheads, and the leads should be carefully protected from chafing against holes in beams, etc. All bends should be as easy as possible.

4. Joints must be carefully made and insulated to the same degree as the cables and should be in places always accessible.

Resin should be employed as a flux for soldering.

In the double wire system joints in flow and return wires should not be opposite one another.

In single wire plants the joints with hull must be accessible. Large cables should be secured in a copper plate bolted to the steel-work of the hull which should be scraped bright at the contact, the area of the contact being at least five times the sectional area of cables. A brass screw with non-oxidizable washer may be employed for single lamps and small cables.

5. Switches should be made so as to act quickly and be either full "on" or "off" without remaining in an intermediate position.

They should have large rubbing surfaces and be so arranged that the friction takes off the oxide formed. A switch should be fitted to each main and branch circuit, and the more important ones arranged so as not to be tampered with by irresponsible persons. In places affected by moisture they should be fitted in watertight boxes having portable covers.

6. Fusible cut-outs should be fitted as a rule at the origin of each branch circuit, and be situated close to switch, those for the larger cables being placed on the switch board. In double wire plants a cut-out should be fitted at the origin of each wire of each circuit. Like switches they should be placed in accessible positions and arranged so as not to be tampered with; be mounted on an incombustible base, and be fitted with a strong incombustible cover which should be watertight where exposed to moisture. They must melt with a current double the normal one, i. e. at 2.500 amperes per sq. in. and care must be taken to avoid mistakes in the size of fuses.

7. Lamps to be of an approved pattern, strong, well insulated, and efficiently secured in their sockets.

Those in machinery space must be watertight, and be protected by a glass globe with wire netting.

In crew spaces, passages, holds, etc., they must be of a strong pattern, efficiently protected by wire guards. Deck lamps as well as side and masthead lamps must be perfectly watertight and be fitted with detachable connections.

Electric Lighting in Oil Vessels

1. In oil vessels alternating current dynamos are strictly prohibited, and single wire plants should not be fitted.

The insulating material must be such as not to be injured by oil or vapors.

The leads must not be run through the tanks, and no switches, cut-outs or joints may be placed in the pump room.

All parts of circuits or fittings where sparks might be produced must be above the tank deck and situated where no gas can accumulate.

Arc lamps may not be used, and all incandescent deck and hold lamps are to be strongly protected by airtight globes with wire netting.

General Arrangement

1. The following precautions are recommended in order to lessen the deflections produced by electric currents: compasses, especially the standard compass, should be at least 33 feet from any continuous current dynamo or electric motor, and 50 feet from alternating current machines. No single wire to be nearer a compass than 16 feet; and if this be not possible the double wire or concentric system should be adopted in the vicinity of the compass. Chronometers also should be kept at a fair distance from dynamos and leads.

The influence of electric currents on compasses must be tested when these are being adjusted, with the vessel's head in any position and with all possible arrangements of currents in the leads likely to affect the compass.

STANDARD CODE OF PRACTICE FOR ELECTRICAL CONTRACTORS

(The following Code of Practice is recommended to architects, consulting engineers, contractors and owners and owners' engineers by The Electrical Contractors' Association of New York as a step toward the standardization of many practices in connection with original contracts and charges for extras which, unless definitely settled in advance, give rise to misunderstandings on both sides and frequently to controversies and litigation. The proposition was presented by F. W. Lord before the recent Contractors' Rally Meeting in New York.—The Editor.)

I. Contractors will submit bids for electrical work upon condition that a full set of plans, specifications and general conditions be placed at their disposal for a reasonable time, free of cost, for use in their office for the purpose of preparing an estimate.

II. The standard form of contract of the American Institute of Architects is to be the basis used for all bids, unless otherwise mutually agreed upon.

III. The contractor shall be paid monthly in cash at least 85% of the value of the materials delivered and the labor performed.

IV. Each contract shall provide for the prompt payment, and require final inspection and payment in full within thirty days of the completion of the work covered by said contract, regardless of the final settlement for the building as a whole or for the work of any other trade.

V. Differences arising between the contractor and other parties on a contract are to be subject to, and settled by arbitration.

VI. The contractor shall not be responsible for loss due to any delay in the execution of the contract when such delay is in no way the fault of said contractor. The time lost by reason of strikes, lockouts, fire, washouts, delays by transportation companies, or any other cause, over which the contractor has no control, will be added to the time of completion of the work covered by the contract.

VII. The contractor does not estimate on or include any charges for surety bonds, insurance not required by law, or any general charges for cleaning, removal of rubbish, patching or repairing of plaster, brick or terra cotta work, breaking of glass, office or telephone service, water, light, heat, fire insurance, use of general gangway, scaffolding, use of hoisting facilities, stenographer, watchman, erection of temporary structures, enclosures or stairs, or any other similar charge, unless mutually agreed upon in advance.

VIII. The contractor shall not be required to cut any work, except his own, and shall not be required to cut, alter or move his own work if due to any cause for which he is not responsible.

IX. Unless specifically provided for in the contract, an extra charge will be made for any special finish or variation from the standard materials. By "standard materials" is meant standard material as regularly listed by the manufacturer whose product is specified.

X. Changes in or additions to contract plans or specifications shall be made the subject of estimate or shall be based on the time and materials involved.

XI. If the regular and normal progress of the work is held up due to extras or changes or other causes over which the contractor has no control, an interference or interruption charge shall be made, depending on the extent of the interference or interruption.

XII. A fair price will be charged for drafting or engineering services when the contractor is called upon to render such services.

XIII. The contractor shall not include temporary work in his estimate unless the quantities are distinctly stated. In no case should be included in an estimate maintenance or cost of current except on a percentage basis.

XIV.—"Cost" shall be understood to mean cost of material and labor and the administrative or overhead expense of the contractor.

THE WIRING OF INFLAMMABLE CHRISTMAS DISPLAYS

F. P. McGough, Chairman of the Show Window and Display Lighting Committee of the Western Assn. of Electrical Inspection, points out the dangers of the temporary wiring of Christmas window displays in a recent article in the Signs of the Times. His remarks are addressed to the manager or window decorator of the store in question, but the caution is one which should be particularly noted by the electrical contractor who undertakes such work. As well as observing especial care as to his own part of the job, he should point out the hazards which should be avoided by the store itself in the use of combustible material or dangerous draping. Experience proves that fires arising from an improper arrangement of electric wiring and lights in connection with inflammable Christmas decorations and displays invariably result from a want of circumspection on the part of those who are not conversant with the electrical fire hazard or the necessary safeguards for its prevention.

All temporary extensions to the electric service to provide additional lighting for such displays should be installed only by competent electricians, and the electrical inspection authorities should be duly notified of such changes so that a proper inspection can be made before the current is applied.

In the installation of the electrical portions of the display, care should be exercised to see that the wires and apparatus are kept well out of reach and securely placed. Advertising novelties and signs of flimsy construction, knife switches, cutouts, motors, flashers and all electrical devices having exposed contasts should be excluded from show windows and kept at a safe distance from combustible material.

Display managers should caution their assistants as to the necessity of keeping inflammable draperies as well as tinsel decorations from the immediate vicinity of fixtures, drop cords, lamps, sockets and receptacles, and should explain to them the danger attending the looping of wires from fixture to fixture to be used as supports for merchandise. In view of the widely circulated information on the dangers that result from the placing of inflammable material in direct contact with electric lamps and the use of combustible lamp shades, the continuation of such practices is inexcusable. The use of cotton batting, tissue paper decorations and similar highly inflammable materials for shop decorations should be abandoned.

Technical Hints

BY GEORGE A. SCHNEIDER

(The form and care with which a contract is drawn often swing the balance in the customer's mind and determine the awarding of the job. Add to this the legal complications which arise from verbal agreements and loosely drawn written transactions and it becomes apparent that the drawing up of the proposal is fully as important as any other part of the contractor's work. A suggested form is offered here for actual use or to serve as a model for a form of your own.—The Editor.)

NOTES ON CONTRACT FORMS

There is an old and well known axiom which states that a little knowledge of law is dangerous. No doubt this has been proven time after time. Still a knowledge of the fundamental principles of commercial law and especially of contract law is very convenient to the man in business. This does not, of course, mean that a business man should attempt to decide legal matters, without the counsel of a competent lawyer, but it can safely be said that a little knowledge along these lines will often help to decide when the services of a lawyer are advisable.

Investigation into the affairs of the average small electrical dealer and contractor will show that most of them do not use any form of written agreement or contract in the pursuit of their business. Most of their transactions are simply verbal agreements or written orders from their customers instructing them to proceed with certain work at a certain price. In either case there are always many chances for a misunderstanding and as a result the contractor may have a difficult time in securing an acceptance of the job and full payment for it.

Written agreements properly signed by both parties involved in the transaction not only tend to eliminate chances for misunderstanding and give reasonable assurance that the payments can be legally collected if necessary after the job is accepted, but they have other advantages as well. For instance, a well written proposal form is a good advertisement for the contractor. It indicates to a large degree the manner in which the contractor conducts his business. Assuming all other things to be equal, there are few persons who would fail to consider more seriously giving the contract to the contractor submitting his proposition in the most businesslike manner. This is not a theoretical argument. It is a fact and very frequently demonstrated in everyday practice. The writer has definite knowledge of a contract involving some $5,000 which was let to a concern practically unknown in the particular field of work simply because of the careful manner in which their proposal was made up. Two of the bidders were old experienced firms and the three bids submitted were practically the same as regards price and the time to complete the job.

Again, a well compiled proposal often serves as a convenient means of checking up various competitors and their interpretations or understanding of the work to be done or apparatus to be furnished. One of the most important clauses in such an agreement or contract is the description of the apparatus, material or work involved. Invariably the various proposals are checked with the one which covers this point most completely, so that if one bidder has not provided for certain apparatus, material or work, it is quickly brought to his attention and all other things being equal militates against his chances of securing the contract. This condition of affairs obtains especially in connection with jobs for which no specifications have been prepared, that is, where the contractor is called in and given a rough idea of the work to be done and then asked to submit a bid conforming with his own ideas as to how the job should be completed.

Then again there are advantages in favor of written contracts in case of death to one of the contract ng parties, in case the business is to be transferred or the contract sublet and many other similar advantages which are generally known and need not be further outlined here.

Realizing that a more general use of a suitable proposal and contract form would tend to place the electrical contracting business upon a safer and more staple basis, one of the large jobbing concerns about one year ago printed a general proposal form for free distribution to its customers or others in the electrical industry who requested them. It is a proposal drawn especially to meet the needs of the electrical contractor, and when properly signed by the parties involved constitutes a contract between those parties.

This proposal is outlined completely in the following paragraphs for several reasons. First, in order that it may be copied in emergency when a suitable form is not available; second, as a guide to those who may wish to have their own forms printed, or otherwise made up; third, to serve as a reminder of the various points to be considered before submitting bids upon any job.

When using this proposal form or its equivalent special attention should be given to the paragraph providing for a general description of the apparatus, material or work involved; the terms of payment; the expiration of the proposition and the acceptance of the proposal. As is noted in the second paragraph, this form provides for as many pages of specifications as are required to properly describe the work to be done or material or apparatus to be furnished. If the proposal is based upon definite specifications which have been submitted before hand to the contractor then generally no additional pages of specifications are necessary. It will be sufficient to make reference to these specifications under the space provided in paragraph four. Otherwise only brief description should be given in this paragraph and a detailed description included on special sheets attached to the proposal. In either case, the description should be so complete that there will be no chances for misunderstanding, either by the parties involved or by anyone who may have occasion to handle the transaction in case of emergency or transfer or for any other reason.

The terms of payment should be carefully stated as this is a point upon which there is often much chance for discussion. Also the contractor must not overlook filling in the expiration date of the proposal as otherwise it would be extended indefinitely.

Except when the transaction is with an individual special care should be taken to determine whether the person signing the contract is authorized to do so and if this signature makes the contrdact a legal docu-

ment. For example, in corporations only certain officers can execute such documents, then again the business may be run on the partnership basis, or the contract may involve an estate, in which case the signatures of certain trustees or executors are necessary before the contract can qualify as a legal document.

So it is in dealing with cities and villages. The authority of public agents is fixed by law. If a public agent of a city or village signs a contract which he is not authorized to sign, it is void. In taking a contract from a small city or village the contractor should get the number of the ordinance authorizing the expenditure and find out from a local bank or an attorney if the ordinance was legally passed, and if the legal indebtedness of the city has been exceeded. If the contract is to be paid for in warrants the contractor should find out from the City Clerk and bank, against what fund the warrants are to be issued and if there will be money in the fund when the payments become due. If the warrants are legally provided for and there will be no money in the fund to cash them, when they are issued, arrangements can usually be made with a local bank to buy the warrants, either at par or at a discount. If necessary at a discount, a letter signed by an officer of the bank agreeing to purchase the warrants at a specified price should be obtained. This letter should make reference to the ordinance number which provides for the expenditure.

Contract Form—Proposal

....., hereinafter called the Contractor, submits for consideration the follow proposal to.....

.....

.....

hereinafter called the Purchaser. When this proposal is accepted and signed in duplicate by the Purchaser and by the Contractor, it shall constitute a contract between the parties hereto.

The Contractor agrees to furnish the apparatus or material or to perform the work described below for the Purchaser, all in accordance with the attached.....pages of the specifications, which are made a part hereof.

All previous communications, either verbal or written, with reference to the subject matter hereof are hereby withdrawn and annulled, and this proposal may be modified only by a supplementary agreement.

General Description of Apparatus, Material or Work:

Location:

The apparatus or material to be furnished or the work to be performed under this contract will be installed in the premises of.....

.....

located at .....

Title to Property:

The title and right of possession to any apparatus or material furnished by the Contractor hereunder shall not pass to the Purchaser until all payments hereunder shall have been fully made in cash, whatever may be the mode of attachment of such apparatus or material to the realty or otherwise. Upon failure to make payments, or any of them, as herein specified, the Contractor may retain any and all partial payments which have been made, as liquidated damages, and shall be entitled to take immediate possession of said apparatus or material and be free to enter any premises where said apparatus or material may be located, and to remove the same without prejudice to any further claims on account of damage which the Contractor may suffer from any cause.

Guaranty:

The Contractor guarantees to correct any defects in the apparatus or material furnished or in the work performed hereunder, which may develop under normal and proper use, within thirty days from the delivery of said apparatus or material, or if work is to be performed, then within thirty days from completion of such work, provided the Purchaser gives the Contractor immediate written notice of such defects, and provided further, that during said period, said apparatus or material shall not be taxed beyond its normal capacity, and shall be regularly cared for and shall be operated normally and properly. The Contractor agrees that all work shall be done in a thorough and workmanlike manner, but he shall not be held responsible for the work done, material furnished, or repairs, or attachments made by others.

Completion:

The Contractor agrees to complete the delivery of apparatus or material or the performance of the work called for hereby within.....days after the date of acceptance of this proposal by the Purchaser, or within.....days after the building is in condition for the Contractor to proceed with the work without interruption. The Contractor shall not be held responsible for any loss, damage, detention or delay caused by fire, strikes, civil or military authority, or by insurrection or riot, or by any other cause beyond his control, nor in any event for consequential damages.

If, during the progress of the work called for in this contract, conditions arise through no default or failure on the part of the Contractor, which prevent the Contractor from proceeding with the completion of his work in the usual manner, the Purchaser agrees to pay the Contractor in full for all work done under this contract; the sum to be paid shall be the proportion the completed work bears to the entire contract and shall become due and payable thirty days after the date upon which the Contractor is compelled to cease work.

Inspection:

All work to be performed hereunder by the Contractor shall be in accordance with the Ordinances, if any, of the City of.....applying to such work, and any certificates required from the officials of said City shall be procured by the Contractor and delivered to the Purchaser. Any fees or other charges made by said City for certificates shall be borne by the.....

Price:

The Contractor agrees to furnish the above mentioned apparatus or material or to perform the work under the provisions herein contained for the sum of.....Dollars (.....) which amount the Purchaser, by his acceptance hereof, agrees to pay in the manner and at the time herein specified.

Terms:

The amount above specified is not subject to cash discount and is to be paid at the office of the Contractor, located at.....in the following manner:

.....

.....

All payments above provided for shall bear interest at the rate of.....per cent per annum after they become due.

Insurance:

The Purchaser shall keep the apparatus or material furnished hereunder insured against fire, in responsible insurance companies, for not less than 80% of the contract price of said material, until fully paid for. Said insurance shall be carried in favor of both parties hereto for their mutual benefit as their respective interest may appear.

Expiration of Proposition:

This proposal is void unless accepted and returned on or before.....days from date of its submission.

Respectfully submitted,

.....

(Contractor)

Accepted this.....day of.....19.....

.....

(Purchaser)

WHAT WESTERN INVENTORS ARE DOING

BY WM. K. WHITE AND H. G. PROST

(If several of your claims are not allowed by the patent examiner, it becomes the duty of your attorney to look into the justice of the decision and contest the findings if there appears to be grounds for such action. It is the general experience of inventors that claims first denied are later granted. The question of fees and time involved are here also taken up. The authors compose the firm of White and Post, prominent patent attorneys of San Francisco.—The Editor.)

NOTES ON THE LAW OF PATENTS

Prosecution of the Application

After the filing of an application in the Patent Office, it is taken up for consideration by the Examiner, and the applicant's attorney is advised of the conclusions of the Examiner in regard to the patentability of the claims. Very infrequently, the application is allowed on this first action, but ordinarily some of the claims are allowed and some are rejected.

To be patentable, the subject-matter of a claim must be novel, useful and the result of an inventive act as distinguished from the product of mere mechanical skill.

Whether the production of a particular novel thing required the exercise of the inventive faculties or required the exercise of only mechanical skill, raises a question often difficult of determination and concerning which courts, patent office tribunals, mechanical experts and patent attorneys frequently hold widely divergent views and opinions. There are many patents which have been adjudged valid by some courts and invalid by others, by reason of a difference of opinion on this question of invention.

In determining the question of the novelty of the subject-matter of a claim, the Examiner is entitled to refer to the whole prior art as disclosed in prior patents and prior printed publications. If the subject-matter of the claim is found disclosed in any such prior patent or publication, the claim is rejected, and, therefore, it frequently happens that the rejection of a claim is based upon some prior United States patent, or upon some prior British, French, German, Swiss, Swedish, Norwegian or other foreign patent or upon some prior text-book, catalogue or other printed publication which may have been published in this or any foreign country hundreds of years prior to the date of the application.

When an applicant learns that his invention is described in a book published hundreds of years before, he is very apt to approve of the following sentiment:

"Confound those thieving ancients who are always stealing our modern ideas."

Frequently a rejection is based upon the Examiner's contention that the invention is merely a combination of two or more disclosures respectively found in two or more prior patents or publications and that the combination, by the applicant, of such disclosures in one machine or device did not require invention but only mechanical skill.

On receipt of the Patent Office letter, containing the Examiner's action, the applicant's attorney is compelled to examine any prior patents or publications, cited by the Examiner as the basis for his action, and determine whether or not the Examiner's action is justified and proper.

If the rejection is proper and the claims are clearly anticipated, the rejected claims must be cancelled or amended in accordance with the Examiner's suggestions made in connection with his rejection of the claims.

If the applicant's attorney is of the opinion that the Examiner's action is improper and not justified by the references cited by him, the attorney replies to the Patent Office action by sending a letter containing an argument pointing out the error of the Examiner's position. In response to such argument, the Examiner again acts on the case and the attorney is entitled to again reply to such action, and so on until the Examiner either finally allows or finally rejects all of the claims contained in the application as filed or thereafter inserted therein from time to time by way of amendment of the application. Some of the claims may be finally allowed and some finally rejected. From such a final rejection, an appeal may be taken through the various Patent Office tribunals and finally to the Court of Appeals for the District of Columbia.

In some cases of a complex nature, the actions of the Examiner and the attorney's replies thereto are very numerous and extend over a period of years. A copy of the application, as filed, together with a copy of all said actions and replies thereto, and of the patent, as finally issued, constitute what is termed the "File Wrapper Contents of the Patent."

The broadest claims of a patent are the ones that cover the very essence of the invention stripped of every non-essential feature. As a rule, the broadest claims in an application are the ones most frequently rejected and the most difficult to get allowed. Such a situation is attributable to various reasons which cannot be set forth in these brief, elementary notes.

The narrow claims of a patent are those that cover the specific embodiment of the invention in that particular form deemed by the inventor to be the best or preferable form and, therefore, a form containing valuable but not necessarily essential features. In other words, the so-called "preferable" form of embodiment is usually a machine containing valuable features, one or more of which can be dispensed with and the machine, nevertheless, successfully perform its functions even though less perfectly or economically.

It is most important for an inventor to appreciate the work done by his patent attorney after the filing of the application. As above indicated, the prosecution of the application to an allowance usually involves a great deal of hard, conscientious work and often embraces numerous and lengthy arguments based upon a detailed consideration of a great many prior patents

and publications cited by the Examiner as the basis for his actions. It is a conservative statement to say that it is the rule and not the exception for an Examiner to finally allow claims in an application which were first rejected by him, and such allowance is due to the persuasive and convincing arguments presented by the applicant's attorney.

It is most important for an inventor to appreciate the fact that "the line of least resistance" for his attorney to follow is to always acquiesce in the Examiner's contention and, without argument or contest, accept whatever the Examiner, in the first instance, is willing to allow. To follow such "line of least resistance" means a sacrifice of the inventor's rights and property, but it also means less work and trouble on the part of his attorney, and the inventor should be keenly alive to such situation. If an inventor expects to secure a patent granting him a monopoly as broad as his invention, he should expect to and be willing to compensate his attorney for vigorously prosecuting the application and conscientiously presenting every point and argument in favor of the allowance of every claim which, in the attorney's opinion, has been improperly rejected.

NEW IDEAS FROM THE WEST

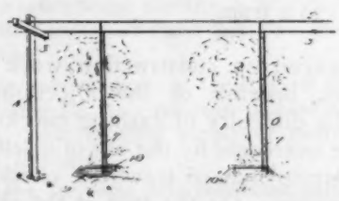
Electric Heater

Patent No. 1,245,084 issued to Edmund N. Brown of San Francisco, and assigned to Majestic Electric Development Company, discloses an electric heater of the reflection type.

This heater comprises a concave reflector having a heating coil arranged at its focus. Surrounding the reflector and extending outwardly therefrom is an annular plate, to which the protecting cage is hinged so that access may be readily had to the heating coil.

Orchard Heating System

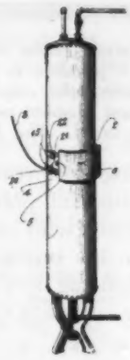
Patent No. 1,245,028 issued to George Q. Riley of Corona, California, discloses a novel system for protecting orchards and orange groves from damage by frosts. A plurality of



open top water tanks are disposed throughout the orchard with the tops of the tanks level with the surface of the ground so that they will receive and collect surface drainage. An electric heater is submerged in the water in each tank and the heaters are connected to overhead service wires, so that when the circuit is closed, the water is vaporized, producing a fog which protects the trees against frost damage.

Heater for Hot-Water Tanks

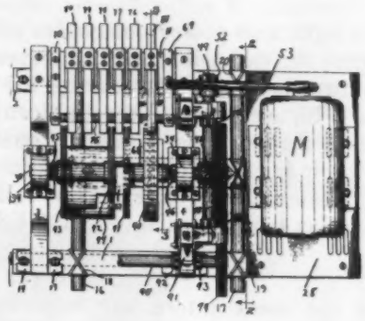
Patent No. 1,244,717 issued to Russell A. Willson of Spokane, Washington, shows an electric heater for hot-water tanks. This heater is adapted to be strapped on to the out-



side of the metallic water tank and consists of a hollow shell within which the heating element is arranged. The edges of the shell are held tightly against the side of the tank, so that an air-tight chamber is formed within the shell.

Sign Flasher

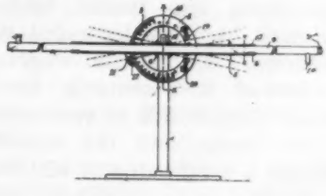
Patent No. 1,245,105 issued to Fred Hotchner of San Francisco, California, discloses a novel form of flasher for



electric signs. This flasher comprises a rotatable contact drum supported in frames which are connected by the brush-holding bar, brushes mounted on said bar and an insulating rod against which the brushes strike when they are not in contact with the drum.

Viscometer

Patent No. 1,244,025 issued to Charles Browning, Jr., of S cramento, California, discloses a novel instrument for determining the viscosity of fluids. The instrument comprises a straight transparent tube which may be set at a predeter-



mined angle to the horizontal. Arranged in the tube so that it is free to roll therein is a sphere of greater specific gravity than the fluid to be tested. The fluid is fed into the lower end of the tube and is discharged from the upper end of the tube and the sphere rolls against the fluid current. The rate of travel of the sphere against the current determines the viscosity of the fluid.

SPARKS—Current Facts, Figures and Fancy

(By special arrangement with the banks of any large city the self-identifying check system may be adopted. This makes it possible to pay even day labor by check and does away with the dangers of robbery, as well as enabling the employer to keep a mechanical record of payments. Prospects for electric vehicles, a vacuum cleaner parade, a reclamation achievement of electric pumps and other items of interest are here discussed.—The Editor.)

Flood lighting is used to protect other things than water-works and industrial plants. Report comes from Stockton of a farmer who suffered from the depredations of thieves in his one-acre bean patch. He installed an electric lighting system and now enjoys the security of an ever constant electric police.

* * *

The authorized electrical equipment for U. S. battleships and battle cruisers totals more than one million horsepower. Each of the last seven battleships, equipment for which has already been ordered, required approximately 33,000 horsepower. Each of the five battle cruisers requires 180,000 horsepower to propel. Each battle cruiser carries four high-speed, turbine-driven generating units.

* * *

Electric light and power companies of California expended more for extensions and improvements than the steam railroads of the state during the four years ending with 1916, according to the California Railroad Commission in a report just issued. Construction of the electric companies during this period amounted to $68,172,678, while that of the steam railroads was $61,155,287. Gas companies invested $16,853,869 additional.

* * *

One of the most interesting experiments ever made in the reclamation of the arid West is at present in progress in Quincy Valley, Wash., where well water is being pumped from maximum depths of 300 feet to irrigate apple orchards, and where at one of the largest plants, about 1,000 gallons a minute is recovered by means of a huge reciprocating pump from a single well in which the water stands about 230 feet below the surface.

* * *

A recent vacuum cleaner campaign in Denver was advertised by a procession of automobiles. In lieu of a band an electric piano mounted on a truck led the parade. Then came two trucks loaded with the machines, followed by cars decorated with suitable advertising banners. A horse and wagon brought up the rear and served to accentuate the comparison feature and make it applicable to sweepers. The campaign lasted two weeks, and the results were 510 machines sold, for a total value of $29,896.

* * *

Bulletins from the Food Conservation Board often contain items of interest to electrical men. Report is there made of a power plant whose consumption of lubricating oil was abnormally large. The engineer was unable to explain the cause so a supervisor was sent to investigate. He drilled into the engine foundation and discovered a small crack in the bedplate casing through which oil was escaping from the lubricating system, a loss that was stopped by closing the crack with electric welding.

* * *

It is probable that after the war there will be a favorable opportunity in England for the sale of electrically propelled vehicles. Many persons are convinced that the price of gasoline will remain high even after hostilities cease, and in fact may never again be as low as in prewar times. When the war is over it is thought that there will be a large demand for the electric car. Several municipalities have been experimenting with heavy electric vehicles and have obtained satisfactory results. They have been found to be especially suitable for such work as town scavenging.

* * *

What comes of analyzing the contents of the waste baskets in two large office buildings may be judged by the following. This is the result of one night's foraging: 1057 gem clips, 390 rubber bands, 68 pencils, 14 McGill paper fasteners, 1 pen holder, 4 pen points, 5 erasers, 4 sponges, 3 thumb tacks, 2 screw eyes, and 5 multiple plugs. In addition to the above there were about 62 yards of rope in various lengths, and some 26 yards of string; also a desk calendar base, half of a memo pad, and a quarter roll of adding-machine paper. The approximate yearly waste in these two buildings is $1350.

* * *

The American soldier is wearing seven league boots these days. Some idea of how quickly the continent is being spanned by the khaki contingent can be obtained from a statement by local officials of the Railroads' War Board, that 8,000 soldiers have just been moved from the Pacific to the Atlantic, 3,700 miles, in just six and one-half days. The men carried all their equipment with them and were provided with sleeping cars by the Pullman company. The trains operated in sixteen sections and consisted of twelve tourist cars and two baggage cars. There were five hundred men to a train.

* * *

Men engaged on construction work are seldom paid by check, because of the objections raised on account of the difficulty of cashing checks. This difficulty can be overcome by the use of a self-identifying feature similar to that of travelers' checks issued by express companies. On the face of the check a space is provided for the signature of the employe, and this signature is written in the presence of the paymaster. Then if the employe endorses the same check on the back in the presence of a bank cashier, or other person who cashes the check, the agreement of the two signatures is sufficient evidence that the right person is cashing the check.

PERSONALS

Lieutenant Edward B. Strong, Jr., of Co. F, 159th Infantry, and **W. A. Strong,** electrician in the U. S. Naval Radio Service, constitute the contribution of service to the nation

from the editorial and managerial staff of the Journal of Electricity. Lieutenant Strong is Treasurer of the Technical Publishing Co., publishers of the Journal of Electricity, and has actively been engaged in its behalf for several years prior to his present service with the government at the National Army Camp at Linda Vista. W. A. Strong, his younger brother, is now somewhere in the Pacific in charge of radio service for the government. These young men, sons of E. B. Strong, president of the Technical Publishing Company, are typical of the spirit of the Great West in their enthusiasm and patriotic fervor for service in the cause of democracy. It is as a consequence, with no little pride, that a service flag with two embroidered stars now hangs in the offices of the company.

C. H. Thordarson, president of the Thordarson Electric Manufacturing Company of Chicago, is a recent San Francisco visitor.

H. J. Gille, sales manager Puget Sound Traction Light & Power Company, Seattle, is making a business trip which will cover a number of eastern cities.

Ralph S. Twogood, formerly in the electrical department of the Southern Pacific Company at San Francisco, has joined the colors as a captain in one of the engineering regiments.

A. J. Twogood, formerly with the distribution department of the Pacific Gas & Electric Co., is now in the electrical department of the Southern Pacific Company with headquarters at Portland.

G. G. Anderson, consulting engineer of Los Angeles, has resigned as advisory engineer of the Imperial Irrigation District, in which work he has been associated with C. E. Grunsky of San Francisco.

M. C. Rypinski, head of the meter and transformer section of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, is visiting San Francisco and other Pacific Coast cities.

H. H. Hoxie, salesmanager of the Electric Railway Manufacturers & Supply Co., has resigned to become associated with the North Coast Electric Supply at Seattle of which Harry Byrne is manager.

C. Whitestone, for some time connected with the Port of Seattle commission on electrical and mechanical work, has been appointed electrical and mechanical engineer by Chief Engineer George F. Nicholson.

Percy E. Wright, consulting mechanical engineer of Seattle, Wash., has taken the management of the Jeffery Manufacturing Company of Columbus, Ohio, for the Northwest and opened offices in the L. C. Smith Building, Seattle.

C. E. Grunsky, consulting engineer of San Francisco, has recently been called to Washington, D. C., for a conference with the Secretary of the Interior in regard to the affairs of the Imperial Irrigation District for which he is consulting engineer.

R. M. Alvord, manager of the supply department of the General Electric Company at San Francisco, has been appointed chairman of the commercial section of the Pacific Coast Section N. E. L. A. to succeed Stanley V. Walton, resigned.

Chas. C. Moore, president and **Elgin Stoddard,** general manager, of Chas. C. Moore & Co., engineers, have returned from the national capital, where important governmental contracts have been let to their firm as announced on another page of this issue.

Walter C. Wagner, an electrical engineer with the U. S. Bureau of Standards, who has been spending some time in the Northwest investigating standardization problems of interest to hydroelectric companies and men of the electrical industry is now in San Francisco.

Charles H. Rattray, construction engineer for the General Electric Company, recently returned to Seattle from China and Japan, where he installed machinery and inspected shipbuilding plants in the latter country. On his way back he visited Honolulu and viewed the volcano Kilauea near that city.

R. H. Ballad, vice-president and assistant general manager of the Southern California Edison Company; **K. E. Van Kuran,** Los Angeles manager of the Westinghouse Electric & Manufacturing Company; and **A. Emory Wishon,** assistant general manager of the San Joaquin Light & Power Corporation, are recent San Francisco visitors.

W. A. Jordan, sales manager of the American Vulcanized Fibre Co. of Bloomington, Del., and **F. F. Skeel** of Chicago, western sales manager of Crouse Hinds Co., are recent Pacific Coast visitors. Both these men are enthusiastic over the

business prospects of the West and men of the industry found genuine pleasure in talking with them during their recent brief sojourn on the Pacific Coast. The Journal of Electricity as a consequence feels unusual pride in having found these men at a moment of leisure in which to get the photograph shown herewith.

H. H. Barter, engineer and technical director of the Triangle Film Corporation plant at Culver City, Cal., has accepted a call to one of the most responsible executive positions in the American International Shipbuilding Corporation of Philadelphia, which is the active agent for the United States Shipping Board Emergency Fleet Corporation.

Fred L. Wright, founder of the California Light and Telephone Company, has retired from its presidency and management to devote his attention to his two big ranches in Sonoma

county. **Leo. H. Susman** of San Francisco has been elected president of the company by the directors; **Frank P. Doyle,** president of the Exchange Bank of Santa Rosa, vice-president; **W. P. Ferguson,** general manager.

A. G. McGregor, a mechanical engineer of Warren, Arizona, who has during the past two years had charge of the installation of the great smelting plants at Ajo and Inspiration, has recently purchased a prominent business block at Warren, in order to acquire greater facilities for his staff of specialists who have designed all of the more recent smelting and leaching plants of the Southwest.

Fred G. Whaley, who has been city engineer for the city of Chehalis and water superintendent the past four years, has resigned his position. Mr. Whaley has taken a position with the state of Washington as valuation engineer, working in co-operation with the state examiner's department on water and light public utilities. He will first be located at Tacoma, but his work will cover the whole state.

Emerson Hoar, electrical engineer for the California Railroad Commission, has been called for service in the next officers' training camp for engineers. Due to the extremely valuable service Mr. Hoar is now rendering the state in studying the interconnection of power lines and the maintenance of continuity of the state's industrial activity an effort is being made to have him exempted from service.

Professor John Fay Wilson has accepted the position of Associate Professor of Electrical Engineering at the University of Southern California in Los Angeles. Professor Wilson occupied for five years a similar position at the University of Michigan, and during the past year at Queens University, Kingston, Canada. He is the author of "Essentials of Electrical Engineering" and "Dynamo Laboratory Outlines."

R. E. Fisher, of the commercial departmentof the Pacific Gas & Electric Company, is receiving congratulations on all sides for the excellent manner in which the annual show of the Pacific Service Employers' Association was recently staged in the Scottish Rite Auditorium in San Francisco. **Harry Bostwick,** assistant to the first vice-president of the company, is president of the association and under his able leadership the organization has grown to be a real force for good in the utility life of the state.

James H. Ellis, research associate in physical chemistry at Throop College of Technology, Pasadena, Cal., has become a member of the physics department of the college as instructor in electrical measurements. Mr. Ellis was graduated from the Massachusetts Institute of Technology in 1912 with the degree of bachelor of science and in 1916 with the degree of doctor of philosophy. He was assistant in the electrical laboratory of the Massachusetts Institute of Technology in 1913-14 and research associate in physical chemistry at the same institution from 1914 to 1916.

W. F. Durand, professor of mechanical engineering at Leland Stanford Junior University, now on leave of absence at Washington, D. C., is chairman of the National Advisory Committee of Aeronautics and chairman of the Aeronautics Committee of the National Research Council. Professor Durand has been engaged on the aircraft problem for some months in Washington and is more familiar perhaps than any other man with the steps this country has taken in the remarkable feat of standardization of aircraft production. He recently delivered a talk before the annual convention of the American Society of Mechanical Engineers at New York City on the subject matter he has under investigation.

Stanley V. Walton, formerly head of the commercial department of the Pacific Gas & Electric Company, is now an energetic "agricola" at Yuba City, California. From latest reports it is said that 3 in 1 oil still keeps the shine on his golf sticks, which were for so long a period a contributor to well earned good times among men of the electrical industry. Mr. Walton states that if any of the old gang wander up his way his phone number is 52F2, the F being short for Farmer. He adds that the geese and ducks are plentiful and that he is open to any new ideas on daylight saving devices, although as a rule he goes to bed at ten with the happy thought that he has nothing to do till two in the morning.

OBITUARY

Thomas A. Cashin, superintendent of San Francisco's Municipal Railway System, died on Dec. 5th at his home in Piedmont, after an illness of several months. Heart trouble was responsible. Mr. Cashiin was appointed as superintendent October 1, 1912, before the city lines were constructed, and served the city from the actual beginning of the building of the lines. He was unmarried.

TELEPHONE COMPANY MAY CHANGE NUMBERS

The Mountain States Telephone and Telegraph Company has the right to change the numbers and the prefixes assigned to its patrons in the telephone directory as may seem to it necessary and best in accordance with rendering efficient service to the public as a whole. Such is the gist of a decision rendered by the Public Utilities Commission of Utah.

NEED FOR MORE HYDROELECTRIC POWER

Unless the Government throws open to development water power sites on Federal lands, gas and electric companies within two years will be unable to develop sufficient power to meet an ever-increasing demand. John A. Britton of the Pacific Gas & Electric Company testified recently before Railroad Commissioner Frank R. Devlin at the opening of the California Railroad Commission's investigation of wartime conditions in corporations that supply the public with gas and electricity.

"The high price of fuel oil makes necessary the development of more hydroelectric power," Mr. Britton said, "but the use of power sites is deterred by the regulations of the Department of the Interior. The Federal Government can give relief by opening power sites on Government lands. If restrictions were removed 500,000 horsepower could be developed in California, and 150,000 horsepower could be developed in two years.

"At the present rate of growth the water power now controlled by the various companies will be exhausted in two years, and that in spite of the fact that the utilities can cooperate by interconnecting and using all power to the limit."

Mr. Britton suggested a plan whereby consumers would share in the cost of extensions. He said the high price of materials and the scarcity of labor made connections difficult. Mr. Britton pleaded for exemption from draft of skilled laborers in plants and systems.

H. F. Jackson of the Sierra and San Francisco Power Company, president of the Pacific Coast Section of the National Electric Light Association, also pleaded for a loosening of Government restrictions on water power sites.

"The companies should divide their territory to avoid duplications of service," he said. "Steam plants might be operated more economically if one were made to serve several companies operating in the same region."

"Banking rules should be modified to permit Federal reserve banks to discount the notes of public utilities," R. H. Ballard, vice-president and assistant general manager of the Southern California Edison Company, suggested. "The financial crisis due to the war has made very serious the problem of financing the natural growth of the companies."

"Virtually all the companies near Los Angeles have interconnected their systems to make use of all available power. The problem now is to avoid duplication of distribution facilities."

Guy C. Earl, representing the Great Western Power Company, said "Government aid in financing is necessary to utilities to carry out extension requirements."

The Railroad Commission will investigate all phases of the war situation in the gas and electric business and report its findings from time to time.

MEETING NOTICES FOR ELECTRICAL MEN

(A recent meeting of the executive committee of the Pacific Coast Section of the N. E. L. A. developed plans for a merchandising movement of considerable importance. The spring convention to be jointly held with the contractor-dealers and jobbers was tentatively scheduled for the third week of April at Del Monte. Important meetings of the San Francisco Development League and reports of activity from both Portland and Los Angeles further mark this two weeks period.—The Editor.)

Pacific Coast Section N. E. L. A.

A special meeting of the Executive Committee of the Pacific Coast Section, National Electric Light Association, was held December 5th, at San Francisco, with President H. F. Jackson, Secretary A. H. Halloran, R. H. Ballard, Henry Bostwick, W. W. Briggs, D. E. Harris, H. C. Reid, K. E. Van Kuran and A. E. Wishon in attendance. Del Monte, California, was selected as the meeting place for the annual convention during the third week of April, 1918. This will probably be a joint convention with the contractor-dealers and jobbers. Robert Sibley, editor of the Journal of Electricity, was appointed chairman of the convention committee. R. M. Alvord of the General Electric Company was appointed chairman of the commercial committee to succeed S. V. Walton, resigned.

Definite steps were taken toward the creation of a closer understanding and affiliation between all branches of the industry with one all-inclusive association as the ultimate object in view.

The executive committee enthusiastically approved the co-operative selling and educational plan submitted by the commercial committee after definite assurance had been given that each branch of the industry would contribute its quota. Comment on this splendid new movement in merchandising may be found on the editorial page of this issue. In detail this plan has been worked out as follows:

First: That the central stations, manufacturers, jobbers, contractors and dealers subscribe to a fund aggregating $12,000.

Second: That the campaign be conducted under the auspices of the California State Contractors' and Dealers' Association.

Third: That it will be the object of the campaign to promote co-operative sales advertising and educational work among those engaged in merchandising of electrical material, assisting the dealers in the proper fitting up of their stores, and providing attractive window displays, etc.

Fourth: That a committee be appointed representing each branch of the industry who will serve as an Advisory Board in formulating ways and means for the handling of the proposed work.

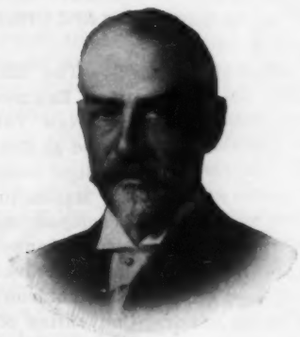
Fifth: The central stations throughout the territory will devote a certain amount of their regular advertising space each week in the conduct of the campaign, and all such advertising will be carried on simultaneously throughout all districts of California.

Utah Society of Electrical Contractors and Dealers

The Utah Society of Electrical Contractors and Dealers, though perhaps the youngest organization of its kind in the West is nevertheless proving itself to be an enthusiastic group of men.

Dec. 18, 1917 is the date set for a program of ambitious proportions. Edgar C. Raine has been engaged to give at Barratt Hall, in Salt Lake City, a travelogue in natural colors on Alaska—the Frontier Wonderland of the World. A campaign for the sale of fifteen hundred tickets at fifty cents each is now under way. Much credit is due G. J. Guiver for his energetic work in promoting the idea.

BUILDERS OF THE WEST—XIX



W. F. DURAND

The helpful activities of the great universities of the West have in the present national crisis called forth unstinted praise on all sides. To W. F. Durand, professor of mechanical engineering at Leland Stanford Junior University, long beloved by the host of engineering students that have gone forth from its halls, this issue of the Journal of Electricity is affectionately dedicated in appreciation of the masterful service he is rendering with the Aviation Board at the national capital, as chairman of the National Advisory Committee of Aeronautics and chairman of the Aeronautics Committee of the National Research Council.

Joint Meeting of the Portland Sections of the A. I. E. E. and N. E. L. A.

The November meeting of the A. I. E. E. and N. E. L. A. was held at the Multnomah Hotel on Tuesday evening, Nov. 20, 1917. The chairman of the evening was E. D. Searing of the Portland Railway, Light & Power Company.

The speaker of the evening was Mr. Preston S. Millar of the Electrical Testing Laboratories of New York City, who spoke on the subject of "Illumination as Applied to Street Lighting," which he illustrated by means of lantern slides.

Mr. Millar first reviewed briefly the history of street lighting, pointing out the common error of the specifications which had been incorporated into street lighting contracts between public utilities and municipalities. He further reviewed the work being done by the Street Lighting Committee of the N. E. L. A. In conclusion, he said that a great deal had been accomplished by this committee, but no final concrete basis had been established by which a specification could be written in order to correctly measure street illumination so that both the public and the utility would receive a "square deal." He warned against utilities "tying themselves up" at the present time on the basis of any of the present-day specifications as there was no one prepared to say whether they could be complied with or not. He is hopeful that in time a thorough method of testing street illumination will be devised, but this service is likely to be expensive as the problem is very intricate.

After the meeting refreshments were served.

San Francisco Electrical Development and Jovian League

Old Timers' Day is one that will long be remembered by those who attended the San Francisco Electrical Development League on Nov. 28, 1917, the day before Thanksgiving Day. From the beautiful but simple little ceremony wherein little tots five years old brought in bouquets of flowers numbering thirty to forty-three carnations each, depending upon the years of service rendered to the industry by the recipient, to the six "Old Timers," the guests of the day, the ceremony

proved interesting and inspiring. Those so signally honored were John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company; Dr. Thomas Addison, western manager of the General Electric Company; Edward B. Strong, president of the Technical Publishing Co., publishers of the Journal of Electricity; Squire V. Mooney, president of John Roebling's Sons Co.; Colonel H. V. Carter, formerly president of the Pacific States Electric Co.; and Frank Smith, general manager of the Frank E. Smith Testing Laboratories.

The sentiment of the day so beautifully brought out by Mr. Britton in his remarks at the conclusion of the ceremony, was also well-echoed in the two little poems, the one calling the meeting of Old Timers through the "Live Wire" and the other lauding the Old Timers at the meeting, as follows:

OLD TIMERS' DAY

BY A. H. HALLORAN

Away out here by the Western sea
There came brave men of old,
To blaze the trail for electricity
In this fair land of gold.

They dared the deserts and tamed the rivers,
They pierced the mountains high,
Let us to them of thanks be givers,
Even both you and I.

Their footsteps were the first surveys
To show the way to go,
We travel now the great highways
That from their toil did grow.

Resistlessly and tirelessly
They played the game of life,
They paved the way for you and me
And cleared away the strife.

To those of them who still are here
Let us all honor pay,
And tribute give to the Pioneer
On this his special day.

PIONEERS — ELECTRICAL

BY E. M. CUTTING

Time was — when men were honored much
And only praised when they were dead;
Gathered friends to speak of love,
Heaping flowers o'er their head.
Of deeds of valor — virtues great,
Writers wrote and poets sung;
Epitaphs were carved in stone,
Anthems o'er the world were flung.
To honor them who still are here,
We have summoned on this day;
Those with courage — visions clear:
Those who pioneered the way.
They who harnessed waterfalls
That have their source among the snows
That bank along Sierra's crest,
And flowing down from dizzy height,
Dispel the gloom and banish night,
And truly make our Golden West.
They who labored many days,
Building — planning — working long,
To make Electric — all the ways
Of men — for them, this praise of song.

The entertainment of the executive committee of the N. E. L. A. by the Electrical Development and Jovian League of San Francisco on Dec. 5th was highly successful. A. H. Halloran of the Journal of Electricity, as chairman, introduced Russell H. Ballard, vice-president of the Southern California Edison Company, and founder of the Pacific Coast Section of N. E. L. A., and Capt. H. F. Jackson, president of this Pacific Coast Section. They spoke of the amending of the constitution in order to include the contractor-dealer and of the efforts made to solve their problems as well as those of the central station.

That the important thing for the industry is for all electrical men of the various branches to come together, have one convention only per year, and consider this a clearing house for the exchange of ideas, was emphasized by A. Emery Wishon, assistant general manager of the San Joaquin Light & Power Co., H. C. Reid, president of the California Association of Electrical Contractors and Dealers, K. E. Van Kuran, Los Angeles manager of Westinghouse Electric & Manufacturing Co., Harry Bostwick, assistant to the first vice-president of the Pacific Gas & Electric Company, W. W. Briggs, general agent of the Great Western Power Company, and D. E. Harris, vice-president of the Pacific States Electric Company outlined the plan for two field men that are to be employed jointly by all branches of the industry in California to personally assist in bettering merchandising conditions in the West. J. E. Woodbridge, chairman of the engineering committee, described the problems in engineering that are now being studied by the Pacific Coast Section, N. E. L. A.

The meeting closed with a recital by G. Herb Palin of the Red Cross poem, his own composition. A unanimous vote of approval of the membership drive to be held on Dec. 16th for Red Cross members was given.

Institute Meeting in New York

The 335th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York, December 14, 1917. Two papers were presented at this meeting—"Magnetic Flux Distribution in Annular Steel Laminae" by Dr. A. E. Kennelly and P. E. Alger, of the Massachusetts Institute of Technology, and "Phenomena Accompanying Transmission with Some Types of Star Transformer Connections II" by L. N. Robinson, of Leland Stanford Junior University. The latter paper is an amplification of Mr. Robinson's former paper presented at the Panama-Pacific Convention of the A. I. E. E., published in the Transactions, Vol. XXXIV, 1915, page 2183.

Jovian Electric League of Los Angeles

The Jovian League of Los Angeles met on Wednesday, November 28, 1917, with Mr. Chester Leatham, manager service department, Otis Elevator Company, as chairman of the day. Mr. George M. Wessells was the speaker for the occasion and gave the Demonstration of Salesmanship for which he is famous. The Ad Club awarded his Demonstration of Salesmanship the prize for the best educational feature of the year.

Paul D. Howse was chairman of the day for the meeting of Dec. 5th.

Nevada Contractors and Dealers Organize

Sunday, December 2nd will long be remembered as the turning-point for the electrical contractor-dealer business of Nevada. Electrical contractors and dealers of that state met at Reno for the purpose of discussing ways and methods of bettering conditions in the industry in that state, and before adjourning formed the Nevada Association of Electrical Contractors and Dealers. Mr. F. V. McAvoy was elected the first president of the baby organization among electrical associations of the Pacific Coast, R. W. Shearer was elected secretary, J. C. Broili, treasurer and F. O. Broili delegate to the Western Conference Board. The constitution and by-laws of the California Association was adopted in full as those which will govern the Nevada Association.

Ways of furthering the uses of electricity in Nevada and co-operating with the power companies were discussed and it is expected to put some of the ideas discussed into active operation at a not far distant date.

Los Angeles Synchronous Club

The second lecture of the Synchronous Club's electrical course on "Electricity and Magnetism" was given by Prof. J. C. Montgomery on Nov. 8th at the University of Southern California.

HAPPENINGS IN THE INDUSTRY

Personal Items

The West has again scored in competitive bidding against the country at large in a $1,000,000 naval contract which has just been awarded in Washington to Charles C. Moore & Co.

Chas. C. Moore

It is for the construction of two big naval oil stations, at Pearl Harbor, Hawaii, and at a point near Bremerton, Wash. The work is to be completed within 270 days. This big new contract includes the oil tanks, the concrete construction, the interconnecting piping equipment and the buildings of this great work.

Charles C. Moore left Washington for San Francisco recently and upon his arrival here is expected to speed up the work on the contract, so that the job will be finished well within the contract time.

L. W. Shirley, formerly general sales manager for the Link Belt Company at Chicago, Ill., is now located in Seattle, Wash., as secretary and manager of the Washington Corporation of the Link Belt Company, with plant and offices at 574-576 First Avenue South.

Nixon & Kimmel, electrical engineers and contractors of Spokane, Wash., have been appointed distributors for the Edison batteries and Edison farm-lighting plans for all territory east of the Cascade Mountains in Washington and all of Idaho and the western part of Montana. They are also distributors of the Robins & Myers motors, dynamos, the Sangamo meters and the Maloney transformers. Nixon & Kimmel have been located in Spokane for 20 years.

Harry A. Flood, president of the Spokane Heat, Light & Power Company, has sold his interests in the company to Field, Richards & Company, Cincinnati. Mr. Flood has resigned and will be succeeded by Ludwig Kemper, representative of Field, Richards & Company in Spokane. The holding company will be discontinued as a medium for controlling the operating company, the stock of which will be distributed share for share among shareholders in the holding company.

Charles W. Reid, vice-president of Rathbone, Sard & Company of Chicago, manufacturers of electric stoves and ranges, who has recently visited all of the larger cities of the Pacific Coast, and who has spoken enthusiastically before the San Francisco Electrical Development League on the possibilities of the West, has returned east after making important announcement of the new activities of his company in the West. The company will establish wholesale offices and a warehouse at Portland as a basis for its operations in the Northwest. Offices and salesrooms are at 306 Oak Street. R. C. Karberg of Spokane is the manager of the new Portland branch. Associated with him as sales maneger is C. F. Jaques of Seattle. At San Francisco, J. M. Merritt is the local manager with Maurice S. Barnett as sales manager. 583 Mission street is the new factory headquarters. The entire organization is composed of enthusiastic, high grade men, and their entrance into commercial activity of the West means much for its future development.

New Power Loads

The Sierra and San Francisco Power Company of San Francisco has completed construction of a three-phase, 11,000-volt line from North Beach Power House, foot of Buchanan Street, to Washington and Mason Power House of the United Railroads. This load was formerly supplied by the City Electric Company. Work has been started on an additional feeder of 350,000 c.m. 3 conductor 11,000-volt cable from North Beach Power House to the Turk and Fillmore Substation. An outdoor substation near Manteca, San Joaquin County, which is to supply the power for the sugar refinery recently erected in that vicinity by the Spreckels Sugar Co., is just about completed. A four-mile branch 60 kv. line has been completed, with an outdoor type substation, to supply energy to the Old Mission Portland Cement Company at San Juan, San Benito County.

Western States Gas & Electric Company has completed work on their part of the transmission system which will connect the distribution system of the Eureka division with the Northern California Power Company. The Northern California Power Company will complete its portion of the transmission line and connection will be made within six weeks, enabling the Western States Company to purchase additional hydroelectric power.

The new paper factory of the National Paper Products Company at Stockton, California, will be under construction soon on a 40-acre site recently purchased. The factory will cost $400,000. It is hoped to have the plant in operation by May 1st, 1918. When completed the factory, equipment, machinery, etc. will reppresent an expenditure of $1,250,000. The factory will specialize in box board and products made therefrom. The capacity will be 75 tons per day. Western States Gas & Electric Company recently secured contract for supplying power for operating this factory to the extent of 1,300 horsepower.

There are now eight electric furnaces in operation in the Puget Sound district of Washington, all engaged in the reduction of steel scrap. Two of these are of 3-ton capacity, the others being smaller. Several other electric-steel reduction works are in process of construction and more are contemplated. General interest in the electrical phases of the industry in that quarter is manifested.

Eight government vessels are under construction at the Marshfield (Ore.) shipyards at the present time, and the announcement is made that the shipyards will receive orders from the U. S. Shipping Board for as many more vessels as it is possible for them to build. The first vessel to be built by the Emergency Shipping Board will be launched by the Kruse & Banks yards.

Changes and Beginnings

The property of the Northern Idaho and Montana Power Company of Byllesby, including the Bigfork power plant, telephone and power lines and real estate, have been sold at public auction to Robert J. Graf for $563,166. The Northern Idaho Power Company was put into the hands of a receiver last January at the request of Mathew A. Morrison, an unsecured creditor.

The San Diego Consolidated Gas and Electric Company is reported to be contemplating improvements to its plant.

The Philadelphia Storage Battery Company, Philadelphia, has opened a branch office and depot at 37 Spear Street, San Francisco. The company's first Pacific Coast branch was opened in Los Angeles a year ago. Arthur Affeld will have charge of the Los Angeles office and A. P. Clark will operate the San Francisco office. C. L. McWhorter, manager of the Pacific Coast division, will make his headquarters at the San Francisco office.

The Sierra and San Francisco Power Company has recently taken over the La Grange Division of the Yosemite Power Company's system and is now operating the same.

Electric Manufacturers Agency, Inc., has been incorporated with head offices at Seattle. This concern succeeds H. G. Behneman, Inc. Manufacturers' Agents and takes over the entire business of the old company, including all assets and liabilities. It will continue business at 617 Fourth Avenue, where its main offices and warehouse are located. Electrical specialties for all installations, also glassware for all installations will be handled. Following is a list of the officers: Joseph Schoemer, president and manager, George Buckman, vice-president, Water Funfsinn, secretary-treasurer. The territory included in its operations covers Washington, Oregon, Idaho, Montana and British Columbia.

The Snowflake & Taylor Mill Company of Snowflake, Ariz., has been incorporated by A. Z. Palmer and J. J. Shumway of Taylor; Walter H. Denham of Shumway; John A. Freeman, Samuel F. Smith, Joseph W. Smith and W. H. Shumway of Snowflake. The company is capitalized at $50,000 and proposes to supply electricity in Snowflake, Taylor Mill and vicinity.

Good progress is being made in constructing the 10,000 kilowatt auxiliary steam plant of the City of Seattle Lighting Department. The framework is completed and the boilers are being installed. During the fall more contracts have been closed per month by the department than for any other period in the history of the plant.

A. H. Cox & Company, machinery and electrical equipment, 309 First Avenue South, Seattle, are moving their offices to 307 First Avenue South, one door north of the old location, where they will have four floors with a 65 foot front and 120 feet deep. Mr. Cox reports a most satisfactory business for the past year particularly with electrical equipment. Their new location will afford double the floor space they have heretofore had.

Must Carry Out Franchise Obligations

Judge John R. Mitchell of the Thurston county, Washington, Superior Court has dismissed the case wherein the Tacoma Railway & Power Company sought to be relieved from payment of gross earnings, taxes and street paving assessments. The decision means about $100,000 saving for the city annually.

Aero-Dynamics Unit to Start

The first unit of an aero-dynamics laboratory, to be started on the campus of the University of Washington, is to be started shortly with funds donated by W. E. Boeing. First unit will be a wind tunnel eighty feet long and twenty feet square in which model aeroplanes will be tested. The course is to begin January 1 and will be in charge of F. E. McKone, professor of mechanical engineering.

Power Properties Sold

The properties of the Northern Idaho & Montana Power Company, including those at Newport, Washington and Sandpoint, Idaho and of the Oregon Power Company at Eugene have been sold at Newport, Wash., by order of the Federal court. George E. Worthington of Spokane, special master, made the sale. The property was bid in by John H. Roemer of Chicago, representing the reorganized companies. The total amount involved in the sale was $5,016,773.

Seattle Municipal Line Loses

The city council authorized a sale of bonds for the Ballard Extension of the proposed municipal line and ordered the bonds to be paid out of the earnings of the municipal railway. Meanwhile the two lines operated by the city suffered a heavier loss from operation in October than in September. The loss in October, according to the report issued by the public utilities department, amounts to $3,410.97, bringing the total losses of the railway since June 1st, 1914 to more than $120,000.

Raise in Wage Schedule

The arbitration board sitting on the street railway strike issues has drawn up a memorandum of awards covering wages and working conditions for the traction employees of the Puget Sound Traction, Light & Power Company and the Tacoma Railway & Power Company. The wage scale for conductors and motormen on the ordinary two-man electric cars was raised 4 cents an hour for each grade of employee.

	Seattle Scale. Old. cents.	Seattle Scale. New. cents.	Tacoma Scale. Old. cents.	Tacoma Scale. New. cents.
First six months	29	33	27	31
Second six months	30	34	28	32
Second year	31	35	29	33
Third year	32	36	30	34
Fourth year	33	37	31	35
Fifth year	34	38	32	36
Sixth year	36	40	34	38

This wage scale is to be in effect as of August 1, 1917. The existing extra pay for the operation of one-man cars and cable cars, and for the instruction of student operators continues.

Telephone Receipts

A statement of gross receipts for the local exchange service and the proportion of gross toll receipts creditable to the San Francisco exchange and accruing from telephones within the city from October 1, 1916, to September 30, 1917, was filed recently with the Board of Supervisors by the Pacific Telephone and Telegraph Company, as follows: Local exchange service totaled $4,334,651.58 and toll receipts creditable to San Francisco exchange were $292,819.51 at gross total of $4,627,471.09.

Earnings of Western Power Company of Canada

The Western Power Company of Canada, Ltd., Vancouver, B. C., reports operating revenues for September, 1917, of $37,887.31, a decrease of 2.6 per cent over the same month last year, and net earnings of $26,757.04, an increase of .4 per cent compared with September, 1916. The net earnings for the year 1917 to date are $239,488, compared with $188,071 in 1916. For the twelve months ended September, 1917, the net earnings are $330,205.86, an increase of 29.6 per cent over the twelve months ended September, 1916.

Interurban Firms Must Pay Industrial Insurance

Judge John R. Mitchell of Washington handed down a decision dismissing the suits brought by the Washington Water Power Company, the Spokane & Inland Empire Railway and the Yakima Valley Transportation Company against the industrial insurance commission. The carriers claimed exemption from the provisions of the industrial insurance law on the ground that the last legislature, in amending the law so as to include first aid and exempt interstate carriers from the operation of the act, had excluded all carriers doing an interstate business. The electric lines in question decided to test the matter in the courts and sued to restrain the commission from collecting premiums. Judge Mitchell in his op'nion holds they must pay.

Alameda Will Re-Sell Power

The city of Alameda voted recently through the city council to buy electric energy for resale ffrom the Great Western Power Company. The public utilities board of the city had previously signed a contract with the power concern but the contract required the approval of the city council to be binding. In addition, the council let the contract to the power company to construct a transformer station at North Pearl street and Blanding avenue for $8771.

The city's electric light plant is unable to furnish profitably the day power needed by industrial concerns. The minimum charge per month for power is to be $50, with a maximum of practically unlimited quantity, the rate of cost decreasing as the volume of current used grows.

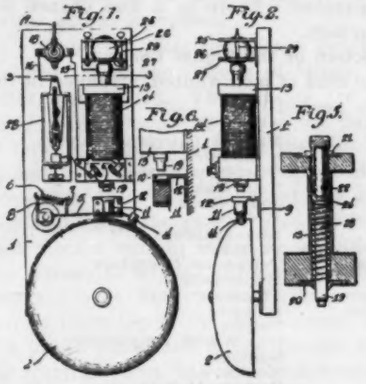
It is possible that the city will now make an effort to supply the Union Iron Works which is now supplied electric energy by the Pacific Gas & Electric Company. The shipyards demanded more current than the municipal plant could supply and also secured from the Pacific Gas & Electric Company a lower rate than the cost of manufacture to the municipal plant. For this reason, after much agitation, the shipyard was permitted to bring "foreign" current into Alameda.

LATEST IN EVERYTHING ELECTRICAL

(The importance of not misunderstanding signals in operating mine hoists makes the improvement of the signal bell a matter of considerable interest. The way in which government orders are taking precedence over private demands has already been felt in the electrical field. A picture of Packard transformers en route and brief descriptions of new electrical apparatus gotten out by various manufacturers follow. —The Editor.)

SIGNAL BELL FOR MINE USE

A signal bell for use in mines has recently been invented by Beryl W. Adams of Troy, Montana. It is particularly adaptable for use in giving signals to the hoist engineers. The purpose is to provide a bell by which a single stroke may be given in clear plain tones and at high speed without confusion.



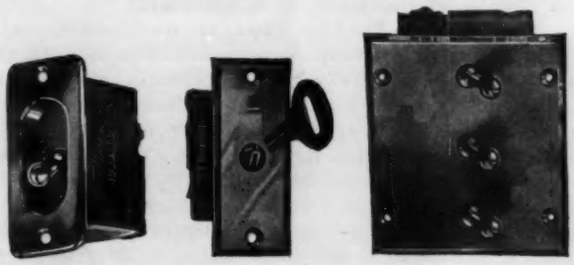
An improved signal bell

It may be used in connection with an alternating current circuit and is so arranged that single stroke signals will be sounded irrespective of whether the energizing connection of the circuit is made of short or long duration, and the parts are so constructed that even when the circuit is connected in for some time, no damage will result. The bell clapper will give a sharp stroke and strike a clear tone and will then be returned to an inoperative relation for successive alarm or signal strokes without depending upon electromagnetic or other electric means.

This device while very efficient is at the same time very simple in construction and operation and does not present any mechanism requiring delicate adjustments.

THE AUTOMOBILE TOGGLE SWITCH

The Automobile Toggle Switch, gotten out by Harvey Hubbell, Inc., was designed with a view toward effecting an improvement over the existing forms of switches for automobile use, such as those employing the miniature push button, or the single plunger type, which consists of pulling out and pushing in a small handle. The convenience of the Toggle switch will appeal to those who have had experience in


Automobile Toggle Switch

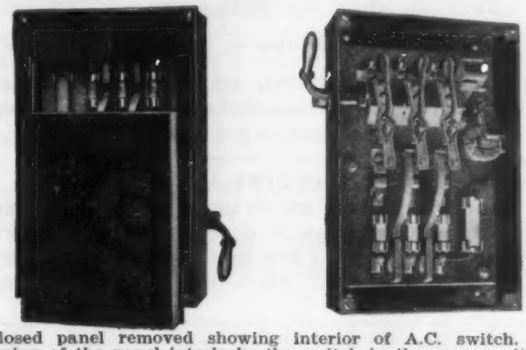
operating either of these types. To throw on the current, the Toggle handle is simply pushed up and the reverse operation opens the circuit. Another very important feature is the indicating arrangement of the Toggle. To the user of this switch it becomes second nature to press the handle up to turn on the lights and down to turn them off.

These switches have a sufficient carrying capacity to carry the load of almost any battery or magneto circuit and have successfully withstood the test as high as fifty watts. The interior mechanism is very simply and strongly made. They can now be furnished in single pole and three-way types with flush plate—single pole and three-way with recessed plate—momentary contact type—double form of momentary contact—battery magneto circuits—single pole and three-way lock switches.

Lighting systems of more or less special character can be arranged by gang combinations made up of these various types.

A C-H ENCLOSED STARTING SWITCH FOR SQUIRREL CAGE MOTORS

The new C-H enclosed Starting Switch provides the motor with protection against overload and against unexpected re-starting after there has been an interruption in the circuit or failure of voltage. It also insures safety to the operator under all conditions, because he cannot touch a live


Enclosed panel removed showing interior of A.C. switch. The lowering of the panel interlocks the switch in the open position.

part while operating the switch, nor when inspecting or renewing fuses. The sliding panel, which encloses the contacts and fuses, interlocks with the mechanism so that the switch cannot be closed and the fuses are always dead when the sliding panel is in the lowered position.

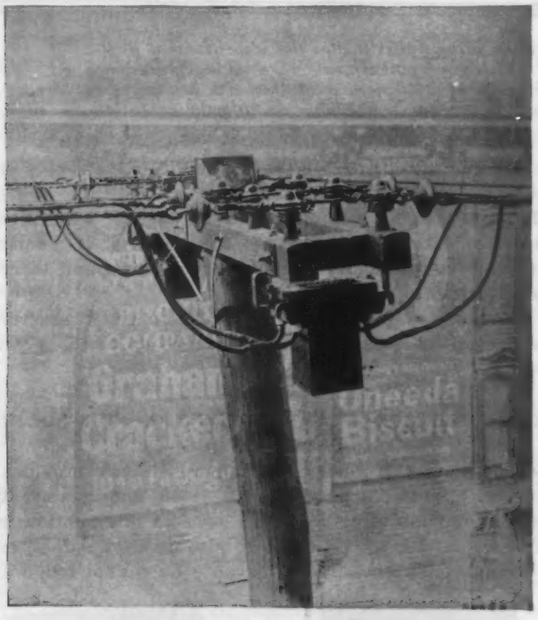
The fuses are not in circuit when starting but are automatically included in the motor circuit when the starting handle reaches the running position. The fuses can therefore be of sufficiently low capacity to give proper protection to the motor windings. Failure of voltage causes the switch to open. Unexpected re-starting with the resultant possibility of injury to operator or machine driven does not occur because the starting lever must be manipulated to again start the motor.

The interior parts consist of three moving contact fingers, which, when the starting lever is moved to the extreme upward position, make contact with three stationary contacts, connecting the motor directly to the line. After the motor is up to speed the hand is removed from the handle and the contact fingers slide into engagement with the running contacts, the change being made without opening the motor circuit. The capacity of this standard switch is 3 h.p., 110 volts; 5 h.p., 220 volts. It is designed and made by The Cutler-Hammer Mfg. Co., of Milwaukee.

COMPACT LINE SECTIONALIZING BREAKER

Pole-mounting, non-automatic oil circuit breakers have been supplied by the Westinghouse Electric & Mfg. Company

based upon an ingenious idea suggested by the Edison Electric Illuminating Company, Brooklyn. Galvanized iron straps are bent and drilled so as to be attached by one bolt to the cross-arm and by the cover-clamping bolt of the Type D non-

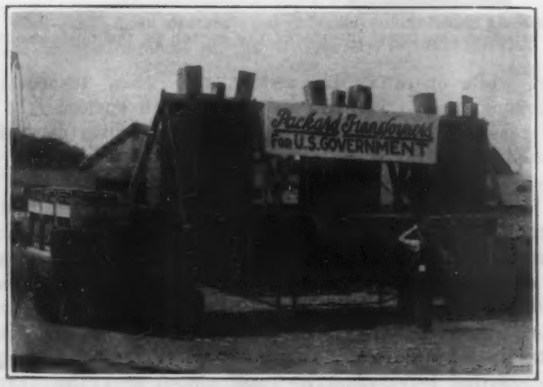


Line Sectionalizing Breaker on Brooklyn Edison Lines

automatic oil circuit breaker, longer bolts than standard 4,500 volt 2-phase wires being dead-ended on strain insulators tied together and supported by pin insulators.

WHY SOME ORDERS ARE HELD UP

Big electrical units are no longer a novelty, but we reproduce herewith a picture of three heavy-duty transformers which were delivered to Uncle Sam by The Packard Electric Company of Warren, Ohio. The picture will serve to reconcile



Loaded with transformers for the U. S. Government

some of our readers to the delays their orders have been subjected to owing to priority of government requirements. The electrical industry is being extended to the limit in this direction and the Packard Company has been doing its bit along with the rest of us.

TORPEDO STATION SWITCHBOARD

The Metropolitan Electric Company, 524 First Avenue South, Seattle, is engaged in the work of constructing a switchboard for the United States naval torpedo station at Keyport, Washington. On account of the uses to which the equipment will be put, the job is very much out of the ordinary. The contract amounts to about $4000.

MEN WANTED FOR THE ARMY

Ordnance Department

Electricians are wanted for early service overseas. The men in the front line trench need the help and co-operation of skilled men back of the lines, and men with experience in all lines of electricity are wanted at once for the Enlisted Ordnance Corps, National Army.

Uncle Sam is calling on our trade to come across and help his fighting men. There is a lot of work to be done over there, and the call has gone out for electricians between the ages of 18 and 40 who want to do their bit, and who know their job.

Modern war is a tremendous business, and the army that wins, is the army which has the best equipment and the best men. The men are over there now—they are ready to go ahead, but they still need experts in our line to repair and maintain their equipment. There is a fine chance for every man who wants to help.

Aviation Section of the Signal Corps

Here is a list of the kind of men wanted, arranged in the order of number of men needed:

Chauffeurs
Auto Mechanicians
Automobile Engine Repair Men
Office Clerks
Carpenters
Radio Operators
Electricians
Instrument Repair Men
Cooks
Coppersmiths
Armorers (Machine Gun Repair Men)
Sail Makers
Photographers
Machinists
Blacksmiths
Motorcycle Repair Men
Stenographers
Cabinet Makers
Draftsmen (Mechanical)
Magneto Repair Men
Metal Workers
Automobile Engine Testers
Rope Riggers (Cordage Workers)
Propeller Makers (Airplane)
Riggers (Airplane Assemblers)
Telephone Linesmen
Tool Makers
Vulcanizers
Welders
Lithographers
Packers
Telephone Operators
Motorcyclists
Plumbers
Painters
Tailors
Gas Works Employees
Buglers
Moulders
Pattern Makers
Telephone Adjusters
Barbers
Truck Masters
Brick Layers
Cobblers
Propeller Testers (Airplane)
Boat Builders
Saddlers
Stock Keepers (Experts)

The Signal Corps

Electrical Engineers: The Signal Corps of the Army is in need of the services of electrical engineers, more particularly of those who have had radio-communication experience of some kind. The work is expected to consist of experimental trials of radio apparatus, in general laboratory work, and in the instruction of personnel in the use of new types of radio equipment. Those who believe that their training or experience fit them for service of this character are requested to communicate with the Secretary of the Institute, 33 West 39th St., New York, stating fully their education, experience and their exact present status in the draft.

Electricians: Training schools for temporary specialists of the Coast Artillery Corps were opened about Nov. 19, 1917. Men who have had an electrical education equivalent to two years college work or who are thoroughly familiar with electricity and electrical apparatus and are now proficient in mathematics should apply for this course. They will be fitted for Electrician Sergeants, 2nd Class, who are charged with the care, operation and repair of electrical installations at Coast Artillery posts, which include power plants, telephone systems, searchlights, gasoline engines, cable repairs, etc. The monthly rate of pay is $44.00 for first enlistment, with promotion as vacancies occur to Electrician Sergeant, 1st Class at $51.00 per month; Engineer $71.00 per month, and Master Electrician at $81.00 per month.

Mechanical Draftsman: The Ordnance Department needs mechanical draftsmen and, unless the situation is corrected, war preparations will be seriously retarded. An intelligent investigation will be made of the fitness of every volunteer and such volunteer given an immediate rating according to ability.

BOOKS AND BULLETINS FOR ELECTRICAL MEN

Upbuilding the Industry

The Engineering Experiment Station at Purdue University is described in a pamphlet gotten out by the Engineering departments of that college.

Circular No. 68 of the Bureau of Standards is entitled "Public Utility Service Standards of Quality and Safety." A brief description of the work done and the material contained in other circulars under the heading "Standards for Electric Service" is here given, together with a synopsis of the National Electric Safety Code and an account of the work done toward Electrolysis Mitigation. A rather complete listing of bulletins on these subjects forms the main subject matter of the pamphlet.

"Approved Electric Lamps for Miners" is the title of Bulletin 131 of the Bureau of Mines, Department of the Interior, just issued. The authors are H. H. Clark and L. C. Ilsley. This bulletin describes the development of a number of types of lamps that meet the requirements, and discusses in detail the features and qualities of these lamps, which in November, 1916, were being put into use by mine operators in this country at the rate of about 2,000 a week. Those lamps that meet a certain minimum specification are approved by the Bureau of Mines. No manufacturer is required to obtain this approval, but the manufacturers have voluntarily submitted their lamps for investigation and criticism. None of the lamps submitted to the bureau was found acceptable in its original form, and the co-operation with the Bureau of Mines of the makers of lamps, bulbs, and cords has extended over the past three years, and the art of making safe miners' electric lamps has thereby been developed much more rapidly than would have been the case had the development been solely the result of commercial exploitation. Also, it is believed that by this method the mining public has been saved expensive and dangerous experiments, which might have cost many lives and for a time condemned the electric lamps as an impracticable device.

Books and Bulletins on the War

The American Red Cross has recently issued a book of some 150 pages which interestingly describes its work at home and abroad. In view of the Christmas membership drive now being launched, the book is one of particular interest.

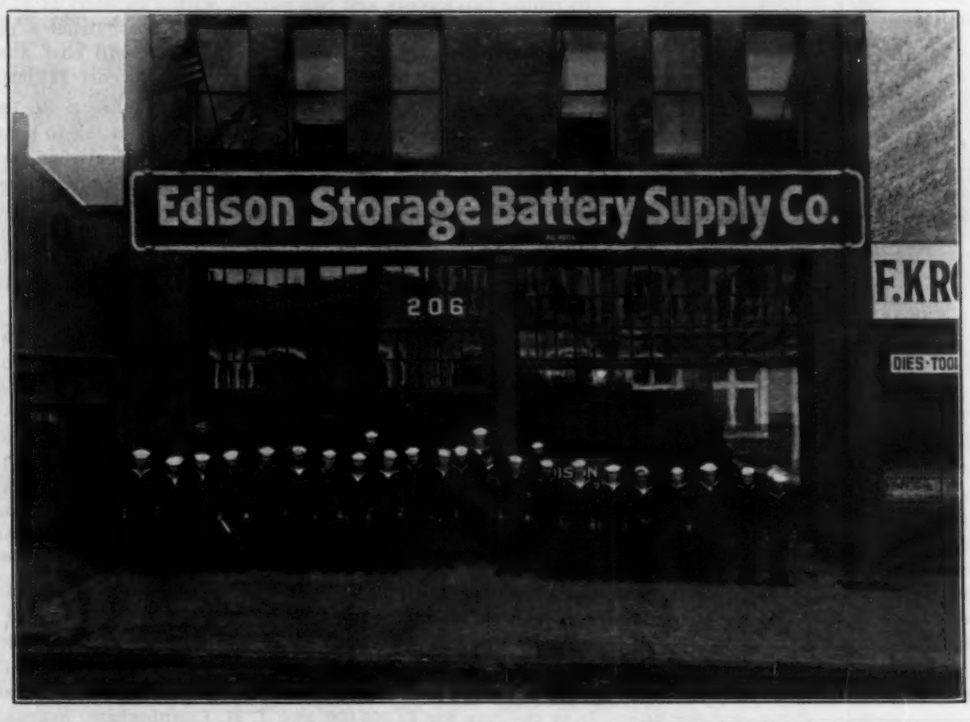
"A Reference Book for Speakers" is the title of a little booklet published by the League to Enforce Peace of which Wm. H. Taft is President. The matter here presented is such as would provide suggestive arguments for the 4-minute men and other speakers on patriotic subjects.

German preparations for trade after the war are being scrutinized carefully by experts in the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, and the recent important report on the subject of "German Foreign-Trade Organization" by Chauncey D. Snow, which touched on this point, has been in such great demand as to establish a new sales record for Government trade reports. The Bureau now plans to get out a supplementary bulletin on German trade and preparations for the commercial future about the first of the year, and further supplements as rapidly as important additional information is received.

Of Interest to the Trade

A 24-page booklet on Condensite has recently been given to the trade by the Condensite Company of Bloomfield, N. J. An idea of the almost unlimited diversity of uses to which Condensite has already been put can be obtained from the statement that it is used for buttons, tobacco pipes, golf clubs, insulating parts of all kinds, commutators for automobile horns, printing wheels for typewriters, vending machine bases, Edison Diamond Disc phonograph records, and for a multitude of other mechanical uses.

A new device for sending money through the mails is being advertised by the Lindley Box and Paper Company of Gas City, Indiana.



HELPING TO WIN

A few Navy boys from Mare Island visit the Edison Plant at San Francisco to learn how a storage battery is made.

The management has further supplied parts of the battery for classroom instruction and will later give an illustrated talk for the class

NEW ELECTRICAL DEVELOPMENTS

(A six million dollar power plant to be built on the Feather River, California, progress in the electrification of railroads in the Northwest, the shutting down of the steam plant in Pasadena and the substitution of power from the Southern California Edison Company and plans for obtaining power for mines in the Intermountain district are the events which mark the activities of the month to date.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—Portland Railway, Light & Power Company has completed plans for the erection of a pump house on the water front at the foot of Nicolai street at a cost of $1025.

WHITE SALMON, WASH.—With the recent purchase of two lots in White Salmon by the Pacific Power and Light Company it is learned that a large sub power station to serve the city is to be erected soon.

EPHARATA, WASH.—The Doerr-Mitchell Electric Company of Spokane has the contract for equipping the new court house at this place with electrical fixtures at $1200. The ou'nt will be manufactured at the factory of the company.

SEATTLE, WASH.—The Moran Manufacturing Company, 1220 First Avenue South, has secured the contract for furnishing the high pressure fire pump for the new harbor patrol boat for the city of Seattle, contract amounting to $1765.

PORTLAND, ORE.—Chief Engineer Hergardt has been authorized by the Commission of Public Docks to ask for bids on motors and transformers for the St. Johns terminal project, which includes municipal grain elevator and additional dock space.

WALLA WALLA, WASH.—Pacific Power & Light Company has made application to the commissioners of Walla Walla county for the right to erect, operate and maintain electric power transmission lines over certain highways of the county.

SUNNYSIDE, CAL.—The street lighting system is partially completed and the constant current transformer has been connected and put into service to supply about 30 lights. The balance of the system will be cut in as soon as the necessary line work can be completed.

PROSSER, WASH.—The city council has voted to accept the lighting contract tendered by the Pacific Power & Light Company. This is a 10-year contract and provides for additional lights and the changing of the system to the incandescent type to replace the arc lights.

ST. HELENS, ORE.—The Milton Creek Logging Company, which operates a large camp about seven miles west of this place, recently installed an electric light plant at the camp and the cookhouses, locomotive sheds, bunkhouses and clubrooms are now all electric lighted.

VICTORIA, B. C.—C. H. E. Williams, Securities Building, Seattle, has the contract for installing electrical equipment including lighting and power in the assembling plant at this place being erected by Grant Smith & Company and McDonald Ltd. for the Imperial Munitions Board.

TACOMA, WASH.—The city council has voted to extend the present municipal car line approximately one mile on the tide flats at a cost of about $18,000. The public department has received the block and signal system for the municipal car line and it will be installed at once.

SILVER LAKE, ORE.—Work on the $900,000 Ochoco irrigation project is progressing rapidly. Eight cars of equipment have been shipped from Seattle, one item of which is a 650 horsepower electric motor, for which a power line is to be built at once by the Deschutes Power Co.

SEATTLE, WASH.—At a recent special meeting of the city council an existing ordinance, providing for a bond issue of $40,000 to make the Ballard extension of the city car line, was amended by providing that the issue may be raised in the future to $125,000, bonds to be retired in from three to 12 years.

TACOMA, WASH.—C. D. Atkins, commissioner of public works, reports to the city council that the Foundation Company desires double track laid from its plant to the viaduct, offering to pay for construction if the city will do the work and furnish equipment for the car line. Cost would be about $15,000.

RENTON, WASH.—Plans have been completed by the engineering department of the Milwaukee & Puget Sound Railway Company for construction of a reinforced concrete substation here together with three bungalows. This substation is a unit in the electrification of the company's road over the Cascade mountains and will cost about $75,000.

SEATTLE, WASH.—The city council has appropriated $38,200 for the second section of the northerly extension of Division A of the municipal car line from Market and Leary streets to the intersection of the Loyal Heights line at 23rd Avenue Northwest and West 67th street and $22,000 for the double tracking of the municipal line on Nickerson street.

GOLD HILL, ORE.—The Grants Pass-Gold Hill irrigation project, taking water from the south side of Rogue river above Gold Hill, will probably be enlarged according to plans of the city of Gold Hill. The final survey by the engineers in charge covers the McClure dam site and ditch owned by the city of Gold Hill, which controls water to develop 500 horsepower.

ONTARIO, ORE.—Orders have been issued by the board of directors of the Owyhee Irrigation District for a pumping plant to insure sufficient water for the irrigation of the Owyhee lands at all seasons. The plans call for a two-unit plant, including two motors and two pumps, with a capacity of 27,000 gallons per minute. It will be necessary to construct a pipe line besides the motors and pumps, which will cost about $2500 additional. The motors and pumps will cost $15,000.

SEATTLE, WASH.—The Chicago, Milwaukee & St. Paul Railroad Company has awarded contracts amounting to nearly $2,000,000 for electrical equipment for its new electrified division. The equipment contracted for includes 17 electric locomotives at an average price of about $100,000 each and substation machinery for the 216-mile Othello-Seattle-Tacoma division. The orders were divided between the Westinghouse Electric & Manufacturing Company and the General Electric Company.

ROSEBURG, ORE.—The big California Oregon Power Company dam at Copco, Cal., on the Klamath River, is completed and the reservoir has now started to fill. The dam is 95 feet across at the base and 500 feet at the top. It develops 26,000 horsepower now and as much more can and will be developed later. The power generated will be used in the various projects of this corporation in this part of the state. By the construction of a similar dam just below the present structure the company plans eventually to bring the total horsepower up to 103,000.

TACOMA, WASH.—The city is considering the different power sites that are being offered, in view of the fact that it is necessary to acquire more electrical energy at the earliest possible moment. F. K. Owens, owner of a power site on the Stillaguamish river near Everett, recently made an offer to sell it to the city for $4,000,000 and J. H. Cunningham, hydraulic

engineer of Portland, has offered the city a power site on the headwaters of the Cowlitz river within 58.8 miles of the city, upon which $260,000 worth of preliminary survey and construction work has been done.

THE PACIFIC CENTRAL DISTRICT

MERCED, CAL.—Steps are being taken to take over the electric light, gas and water systems. The city engineer is preparing an estimate of the cost.

MERCED, CAL.—A crew of workmen is installing a power line to Coulterville, Mariposa county, where the streets and houses are to be electric lighted soon.

MODESTO, CAL.—The Tidewater Southern line is planning to complete its 10-mile extension to Livingston. It is also planning to electrify the line southward from Modesto.

MENDOCINO, CAL.—The Fort Bragg Electric Light Co. has decided to place meters in all places where current from its lines is used. The company will place additional street lights where necessary.

OAKLAND, CAL.—The Pacific Telephone & Telegraph Company has let the contract for structural steel work on its new office building to be erected at 15th and Franklin streets, and work will start at once.

BISHOP, CAL.—The Railroad Commission has extended the time in which the Bishop Light & Power Company may complete its reconstruction work—one-half to be completed before Dec. 31, 1917, and the entire work before June 30, 1918.

REDDING, CAL.—Owing to the difficulty of getting supplies into the Big Bend country on the Pit river, the Pacific Gas & Electric Company has shut down its work on the seven-mile tunnel it is building at a cost of $17,500,000. Work will be resumed in the spring.

OAKLAND, CAL.—Alleged unpaid franchise taxes due the city from the San Francisco-Oakland Terminal Railways, aggregating in the neighborhood of $1,000,000, have been discovered by City Clerk L. W. Cummings and brought before the council by Mayor John L. Davie, who instructed the city attorney to start proceedings to collect.

YREKA, CAL.—Word has been received here that the water which has been impounding behind the big California-Oregon Power Company dam at Copco has risen the 112 feet to the top of the dam much quicker than anticipated, and begun running over the top. The power company expects to have water running through the pipes and generating electricity by December 15th.

MERCED, CAL.—The proposition of increasing the scope of the proposed irrigation district movement to include a larger project to handle drainage, electric power and a telephone line was instituted at the meeting of the Livingston farm center when the resolution favoring the irrigation district plan, recently endorsed by the directors of the county farm bureau, was presented to the Livingston center for ratification.

SACRAMENTO, CAL.—A proposal for the city of Sacramento to buy the building at present occupied by Weinstock, Lubin & Company, Fourth street, K to L, for the purpose of transforming the large structure into an auditorium and union passenger station for all electric railways entering this place is soon to be made. While details have not been worked out, it has been learned that the property can be purchased for $375,000.

STOCKTON, CAL.—An application has been filed by the Western States Gas & Electric Company with the State Water Commission asking permission to appropriate 5,000 acre-feet from Medley Lake and 7,000 acre-feet from Echo Lake, both in El Dorado county, and 8,000 acre-feet from Twin Lakes in Alpine county, for the purpose of developing 2500 horsepower at the hydroelectric plant of the American Electric Company for a period of seven months in the year.

VISALIA, CAL.—Announcement has been made of a complete reorganization of the administrative system of the Mt. Whitney Power & Electric Company, a subsidiary of the Southern California Edison Company. In place of the large number of small commercial offices scattered through the county, hereafter the business will be handled through three divisional points, with headquarters in Visalia, Tulare and Porterville.

MODESTO, CAL.—The Modesto plant of the Sierra & San Francisco Power Company is installing, as rapidly as possible, improvements on the plant, which will cost $30,000. This is being done in order to accommodate the rapidly increasing demand for power and light service in this community, as a result of factories, business houses and dwellings in construction or operation.

EUREKA, CAL.—During the week ended November 3rd the Eureka division of the Western States Gas & Electric Company secured a contract with the California Central Creamery for the power requirements of their new plant at Arcata. The Rolph Ship Yards are being supplied an additional 40 horsepower in motors. The Western States Company is now negotiating with the Arcata Barrel factory for the power requirements of their new factory, estimated at 150 horsepower.

CLOVIS, CAL.—The Fresno Flume & Lumber Company has filed notice of application for 200 cu. ft. per second of the waters of Dinkey Creek, tributary of Kings River, for power purposes. The plans provide for a main ditch, tunnel and pipe line 4½ miles long, and the storage of 25,000 acre feet of water. The company has also filed an application for 400 cu. ft. per second of water in Big Creek, also tributary of Kings River, the water to be used in connection with the above power project. The main ditch and pipe line in the latter is given as 8 miles in length.

OROVILLE, CAL.—The Great Western Power Company has purchased 1255 acres from E. E. Biggs and the land will be the site upon which the new $6,000,000 power plant of the power concern will be built. The tract commands a frontage of 2½ miles on the Feather River. The water for the new plant will be diverted from the North Fork of the Feather River immediately after it leaves the Las Plumas plant of the company. It will be carried in a huge concreted canal to a point about two miles north of Oroville, where it will be dropped a distance of 500 feet into the power plant. The rights-of-way for the canal have already been obtained. The plant is intended to generate about 60,000 horsepower.

SAN FRANCISCO, CAL.—United Light & Power Company, represented by F. C. Riley and G. W. Gilbreth, of Los Angeles, has applied to the California State Water Commission for permission to appropriate 15 cubic feet per second from the waters of San Gabriel River in Los Angeles county for use in generating electric power for commercial purposes. Power is to be generated by impulse wheels direct connected to electric generators. A total fall of 1280 feet will be secured and 10,000 horsepower will be generated. The proposed work includes the driving of a tunnel and pipe line two and one-half miles long, the construction of a dam 200 feet high and 500 feet long. Construction is to be completed in two years and the entire appropriation of water is to be utilized within five years.

THE PACIFIC SOUTHWEST

EL CENTRO, CAL.—Bids will be received up to December 18th, for $1,500,000 Imperial irrigation district bonds.

LOS ANGELES, CAL.—The California Railroad Commission has authorized the Southern Sierras Power Company to operate in Blythe, Cal.

SAN FERNANDO, CAL.—The board of trustees has appropriated $2000 for the lighting of a portion of McFarland street which is now being re-graded and paved.

YUMA, ARIZ.—The mayor failed to sign a resolution passed by the city council calling for an election to vote bonds to purchase the plant of the Yuma Light, Gas & Water Co.

VENTURA, CAL.—The contract for the installation of an ornamental lighting system in District No 1 of Ventura has been let to G. W. Sparks of Los Angeles on his bid of $4665.

WILLIAMS, ARIZ.—An ordinance has been adopted by the common council providing for the issuance, advertisement and sale of the $35,000 electric light plant bonds and $55,000 waterworks bonds voted on Nov. 6th.

HOLTVILLE, CAL.—The Railroad Commission has extended the time in which the Holton Power Company may complete its work. At least half of the reconstruction work must be completed before Dec. 31, 1917, and the entire work before Dec. 31, 1918.

LOS ANGELES, CAL.—The council has adopted the report of the finance committee recommending that the city attorney, city engineer and city electrician prepare an ordinance for the installation of an ornamental lighting system in the Van Nuys district.

LOS ANGELES, CAL.—Sealed bids will be received by the board of public works up to Jan. 7, 1918, for furnishing the necessary lighting posts and appliances for lighting North Broadway between California and 1st streets, and Broadway between 1st and 10th streets.

YUMA, ARIZ.—Application has been made to the board of supervisors by Wm. Kryger for a franchise to construct a pumping plant on Colarado River at a point in Yuma county, and pipe line system therefrom to Yuma mesa, for the purpose of providing irrigation water.

RIVERSIDE, CAL.—The Railroad Commission has extended the time in which the Southern Sierras Power Company may complete its reconstruction work. One-third is to be completed before Dec. 31, 1917, two-thirds before Dec. 31, 1918, and the entire work before June 30, 1919.

TEXICO, N. M.—The State Line Utilities Company has been granted a franchise by the Board of County Commissioners to erect a high-tension transmission line from its power plant, which is to be located at Texico, along the road connecting Texico and Clovis and south to Portales.

SAN DIEGO, CAL.—An ordinance has been adopted by the board of supervisors granting the San Diego Consolidated Gas & Electric Co. a franchise for the construction of poles and wires for transmitting electricity within San Diego county, outside the boundaries of incorporated municipalities.

LOS ANGELES, CAL.—The immediate purchase of enough aqueduct power bonds to build municipal power plant No. 2, by the city, with the sinking fund will be recommended to the city council by Mayor Woodman. This plant in San Francisquito canyon, developing 25,000 h.p., will cost about $750,000.

PASADENA, CAL.—The city of Pasadena, where the electric light and power business has been divided for many years between the municipally-operated plant and the Southern California Edison Company, has made a proposition to the Edison Company which the latter accepted, on the lines of the contract made last May with the city of Los Angeles. By this arrangement the steam plant of the city will be shut down and the power supplied by the Southern California Edison Company from its hydroelectric plants.

INTER-MOUNTAIN DISTRICT

TROY, MONT.—A franchise has been granted the Snowstorm Mining Company for electricity. Owner, Kootenai Light & Power Company.

MISSOULA, MONT.—The State University campus is to be electrically lighted. Plans for the improvement are being prepared and it is understood the work will be done this year.

BRIGHAM CITY, UTAH.—The Reclamation Power Company has filed an application with the state engineer for 28 sec. ft. of water in Boxelder Creek, to be used for generating electricity.

HARLEM, MONT.—At a recent meeting of the council the bid of the Electric Construction Company for installing the ornamental lighting system was accepted. The work will cost $4340.

EAST HELENA, MONT.—The Forestry Department has granted Jacobs & Flattow of East Helena permission to divert water from the McClellan Creek to develop power to be used in mine development work.

MILFORD, UTAH.—Higher telephone rates in Utah are announced by the Mountain States Telephone and Telegraph Company at Milford. The new rates will go into effect as soon as the new exchange building is completed. The commercial rate will be $42 instead of $36, and the two-party line will be $36.

SALT LAKE CITY, UTAH.—The creation of a special lighting district on Regent street is asked by property owners in a petition filed with the city commission. It is proposed to light the street with a series of 6.6 ampere lights. The matter was referred to the department of streets and public improvements.

SALT LAKE CITY, UTAH.—Preparatory to carrying on extensive development and mining activities in the spring, the Earl Eagle, the Bellerophon and the Globe Consolidated Mining companies have joined in constructing a power line to their properties in the Mary Ellen Gulch of the American Fork mining district.

ELY, NEV.—Plans are being considered for the construction of a large hydroelectric development to supply electricity to the large copper mines in Ely. The installation will provide for an output of 4800 h.p. and will cost about $1,200,000. The company expects to develop 10,000 h.p. in three years. F. B. Ench of Oakland, California, is interested.

SALT LAKE CITY, UTAH.—Oregon Short Line Railroad is planning to spend about $1,000,000 for building about 40 miles of feeder lines in northern Utah and southern Idaho. Specifications provide for an extension of 3.85 miles to Baker spur north of Brigham and 9.65 miles from Garland to Beaver River City. Other improvements are to be made in southern Idaho.

CARSON CITY, NEV.—A formal protest by Nevada against the appropriation of 40,000 acre-feet of water from the Little Truckee River in the Doyle district, Lassen county, will be presented the California Water Board. The water is desired by the Long Valley Irrigation Company, but the Nevada authorities assert there is no unappropriated water along the Truckee.

CARSON CITY, NEV.—Through a co-operative agreement signed by the United States Bureau of Irrigation investigation and the state engineer of Nevada, arrangements have been made for a great irrigation project which includes the straightening of the Humboldt River and the building of several reservoirs along the stream for the storage of water. Owners of water rights and land owners along the Humboldt River have consented to the plans.

POSITIONS WANTED

FOR SALE—1600 feet of 3-0 stranded 3 conductor core rubber insulated covered cable C.L.A. finish, in good condition. For further particulars write to R. Nenzel, Lovelock, Nevada. 12-15

FOR SALE—One 50-kw. Allis Chalmers D.C. Generator, 240 volts, Direct connected to 12 x 11 Chandler & Taylor steam engine, 290 r.p.m. unit can be separated. Roth Blum Packing Co., San Francisco. 1-15

Electrician with good technical education and twelve years practical experience desires position as foreman with manufacturing firm, power station or similar work. Address Box 915 Journal of Electricity, S. F.

Ad-itorial Comment

(Each advertisement in the Journal's pages is good, it has news value and possible use for every reader. Some ads are better than others, either in display, text or timeliness. And in some one's opinion one ad is best. The publishers and advertisers are interested in knowing what the readers think is the one best ad and why. For the best statement of any advertisement's excellence in the next issue, that of Jan. 1, 1918, the publishers offer a prize of $5.00. This competition is open to any reader. Merely write out the reasons why you like some ad and send it to The Aditor, Journal of Electricity, San Francisco. The winning statement will be published in the Feb. 1st issue. These articles should not exceed 150 words in length.—The Ad-itor.)

Plant protection by light projection is the dominant thought in the display advertising columns of this issue. **Crouse-Hinds Company** advise that "night prowlers shun plants illuminated by Imperial flood light projectors," and illustrate five of the many styles they make. **Federal Sign System (Electric)** suggest that "Federal Electric signs protect as well as advertise your place of business" and bring out the adaptability of electric signs to this dual service. **Western Electric Co.** advertise "electric daylight for protection" by means of Davis flood lamps. A typical installation is clearly shown. **Pacific States Electric Co.** present a striking picture of the Marin substation of the Pacific Gas & Electric Co., protected by nine G-E flood light projectors, a typical projector also being shown. **General Electric Co.** portray in a two-page spread the actual installation used by the authorities to protect the East River Bridge at New York City, under the slogan "The new national guardian—flood-lighting."

This patriotic note is sustained by **Baker-Joslyn Company,** Pacific Coast distributors for Duraduct, in announcing that Duraduct is on the list of "the best" that is being sent to France. The Tubular Woven Fabric Co. has been sustained by the United States Circuit Court of Appeals in a decision dated Nov. 14th in its long-standing patent litigation.

Baker-Joslyn Co. are also Pacific Coast distributors for **V.V. Fittings Co.** who devote a page to demonstrate the ease, and consequent profit, of using V.V. fittings for conduit wiring.

Whatever saves labor on a wiring job saves money for the contractor. This is why **The American Conduit Manufacturing Co.** recommend "Wiremold" which any workman can easily install with a hacksaw and screw-driver.

"Quality plus service" in an electric motor is advertised by the **Crocker-Wheeler Co.** who also make a strong point of a large stock in San Francisco and Los Angeles ready for immediate shipment.

Progress profits from the past. No branch of the electrical business has shown greater progress than the insulator manufacturers. **The Locke Insulator Mfg. Co.** call special attention to their new Victor No. 5090 for 60,000 volts.

Sprague Electric Works feature their ability to immediately fill any order for a reasonable quantity of small single-phase motors.

The Egyptian pyramids are famed for permanence. Consequently the **National Carbon Company's** three pyramid trademark back of their carbon brushes is a fitting symbol for brush service.

The especial attention of industrial plant managers and of contractors is called by **The Youngstown Sheet & Tube Co.** to their Realflex armored conductor. The Electric Agencies Co., Pacific Coast representatives, have announced that hereafter they will do no jobbing business, but will act strictly as manufacturers' representatives for the various lines they carry.

The Habirshaw Electric Cable Co. call attention to their general educative efforts to the end that owners should employ expert contractors. This carries with it the suggestion that the electrical contractor will benefit by tieing in with this work.

The running quietness of a **Century Electric Company's** motor is exemplified by its illustrated application to an organ blower in a church, where quietude is essential.

Westinghouse Lamp Co. show a map of the Pacific Slope states with specific designation of the location of all their distributors. This organization is particularly active in backing up its distributors with a sales and advertising service.

The double-jewelled ball bearing of the type OA watt-hour meter is given prominence by the **Westinghouse Electric & Mfg. Co.** as an important feature in securing sustained accuracy. A meter's excellence is dependent upon perfection in its smallest parts.

Electricity fully repays its debt to the copper industry by its indispensable aid as a refining agent. **The Westinghouse Electric & Mfg. Co.** show an installation where nearly 70,000 amperes is being applied to this purpose through Westinghouse booster converters.

The Electric Storage Battery Co. demonstrate the applicability of the "Ironclad Exide" battery to the electric commercial vehicle. They cite the satisfaction given to users of this battery as proof of its worth.

Insurance against defects in Peirce Presteel brackets is automatically given by **Hubbard & Company's** process of manufacture. They not only thus provide adequate line insurance but also provide a bracket for every need.

Detroit Fuse & Mfg. Co. emphasize the safety features of their steel enclosed switches which are rapidly becoming standard for industrial installations. With the tremendous increase in the number of Western industrial plants a large field of application seems open to this equipment on the Pacific Coast.

That specific installations constitute one of the best means for proving satisfactory service rendered is exemplified by the **General Electric Company's** citation of the 86 miles of G-E electric wire and cable used in the new Chicago plant of the Crane Company.

ALPHABETICAL INDEX TO ADVERTISERS

American Ever-Ready Works of National Carbon Co.....
Los Angeles; 755 Folsom St., San Francisco; Seattle.

Associated Engineering & Supply Co.....
San Francisco, Southern Pacific Bldg., Los Angeles- Portland, Vancouver, B. C.

American Electric Heater Co.....
Detroit, Mich.

American Conduit Mfg. Co..... 6
(See Pacific States Electric Co.)

Baker-Joslyn Company.....2–3
71-75 New Montgomery St., San Francisco; 526 First Ave. South, Seattle; 353 Second St., Los Angeles.

Benjamin Electric Manufacturing Co.....
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906 So. Hope St., Los Angeles; 56 Natoma St., San Francisco; 65 Front St., Portland, Ore.

Crocker-Wheeler Co. 8
87 New Montgomery St., San Francisco; 228 Central Avenue, Los Angeles.

Cutler-Hammer Manufacturing Co.....
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Detroit Fuse & Manufacturing Co..... 5
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Detroit Insulated Wire Co..... 9
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Faries Mfg. Co.....
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Moore & Co., Charles C..... 8
Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

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Pacific States Electric Co..... 23
236-240 So. Los Angeles St., Los Angeles; 61-67 Fifth St. No., Portland; 200-210 Twelfth St., Oakland; 575 Mission St., San Francisco; 570 First Ave. So., Seattle; 402 Paulsen Bldg., Spokane, Wash.

Peerless Electric Co..... 28
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Philips Wire Co..... 9
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Thomas & Co., R. .....
Pacific States Electric Co. and Western Electric Co., Pacific Coast Representatives.

Tubular Woven Fabric Company..... 2
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V. V. Fittings Co..... 3
Philadelphia. (See Baker-Joslyn Co.).

Wagner Electric Manufacturing Co.....
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Eighth and Santee Sts., Los Angeles; 1900 Telegraph Ave., Oakland, Cal.; 680 Folsom St., San Francisco; 84 Marion St., Seattle; 45 North Fifth St., Portland, Ore.

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Western Pipe & Steel Co.....
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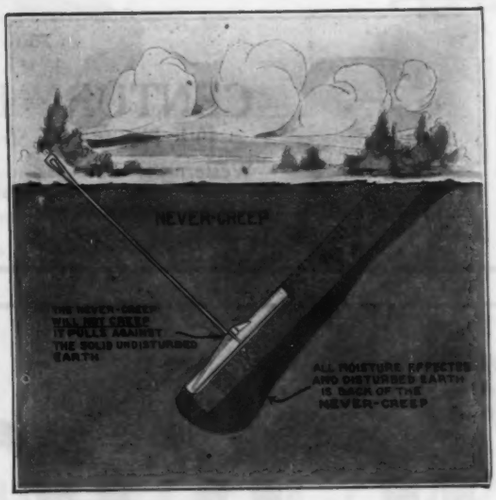
Weston Electrical Instrument Co.....
109 Weston Ave., Newark, N. J.; Frank E. Smith, 682 Mission St., San Francisco.

Youngstown Sheet & Tube Co..... 10
Youngstown, Ohio. (See Electric Agencies Co.)

Let Us Repeat:

"Never Creep" Dead Men Never Creep


NEVER-CREEP
THE NEVER-CREEP WILL NOT CREEP IT PULLS AGAINST THE SOLID UNDISTURBED EARTH
ALL MOISTURE AFFECTED AND DISTURBED EARTH IS BACK OF THE NEVER-CREEP

The only anchor that pulls against the solid earth

There is an excellent way to test these statements.

CHANCE COMPANY
Centralia, Missouri

PACIFIC COAST DISTRIBUTERS

BAKER-JOSLYN COMPANY

353 East Second Street
LOS ANGELES

71-75 New Montgomery Street
SAN FRANCISCO

526 First Avenue South
SEATTLE

Full load to full speed in 2 to 10 seconds—this quick acceleration minimizes the drag on the circuit and together with the low starting current permits of the 1-10 to 1-4 horse power sizes of

⅛ h. p. motor direct connected to a small coffee mill

Century

Repulsion Start Induction

SINGLE PHASE MOTORS

being installed on lighting circuits. A fuse which will protect under full load is usually of ample capacity for successfully starting the ordinary full load.

Other sizes up to 40 Horse Power
25 to 140 cycles

CENTURY ELECTRIC CO.
19th, Pine to Olive Streets, St. Louis, Mo., U. S. A.
Western Sales Offices and Stocks at San Francisco, Portland, Los Angeles, Seattle, Spokane, Salt Lake City
Member Society for Electrical Development—Do It Electrically 246

Victor

Number 5090
—the New Insulator Design
for 60,000 volts

This is one of ten new and improved insulator designs for different voltages that have put a new meaning into insulator strength.

For your reference library we have prepared a supplement to "The Insulator Book."

It definitely points out the advantages secured through these much-needed improvements in design and construction.

Write us for your copy before it slips your mind.

The Locke Insulator Mfg. Co. Victor N.Y.

Save Your Labor Costs

The E.C.&M. Automatic Compensator

The shifting of a million men from the *factories* to *fighting*, inevitably *compels* every labor-employer to do away with the *unnecessary* use of labor — to *replace* human effort by automatic equipment.

The E. C. & M. Automatic Compensator *removes* the skill and labor *ordinarily needed* to start A. C. Motors: with this Compensator, starting an A. C. Motor is as *simple* and *easy* as turning on an electric light.

Merely push one button to *start* the Motor; push another button to *stop* the Motor. The E. C. & M. Automatic Compensator offers so much in the way of *economy, safety* and *speeded production* that it must be judged in terms of *quality* rather than in terms of *cost*.

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND, OHIO

The merchants in your town are getting ready to attract their Christmas trade. What is a greater business attracter than an electric sign? Trade follows light.

Central Station and electrical contractors can safely recommend Federal blue enamel signs.

The Federal plan finances the payments and relieves you of the burden of carrying the account.

This picture shows seven Federal Business Attracters on one block in Reno, Nevada. You can duplicate such an installation and profit accordingly.

FEDERAL SIGN SYSTEM (ELECTRIC)

618 MISSION STREET, SAN FRANCISCO

331 OAK STREET, PORTLAND

506 PACIFIC BLOCK BLDG., SEATTLE

A POPULAR SELLER EVERYWHERE

THE

Western Electric

TOASTER

It's a household appliance that every up-to-date housewife will want—toast really cannot be made and served properly without it.

It makes one of the most acceptable birthday, anniversary or wedding presents ever devised—it looks well, works well and wears well.

Our sales help service is at the disposal of the central station or other electrical dealer handling this "QUALITY PRODUCT"—a service that is rendered without charge—a service that sells the line.

Get in touch with us to-day.

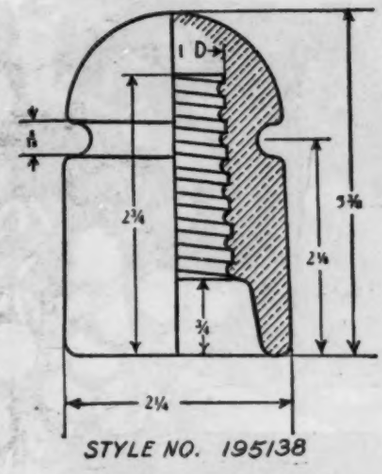
Western Electric Company

INCORPORATED

Offices in all Principal Cities

Westinghouse

Porcelain Pin-Type Insulators



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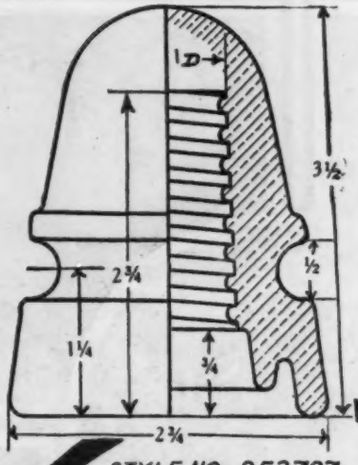

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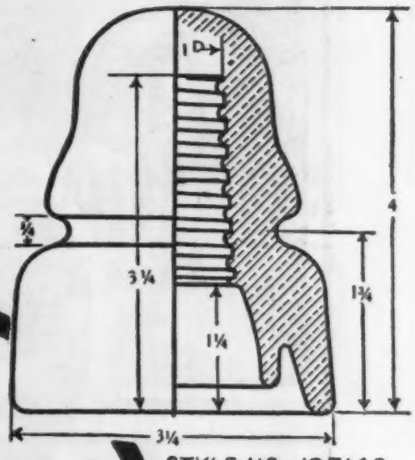

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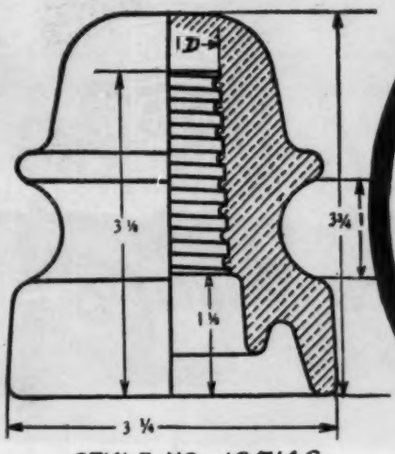

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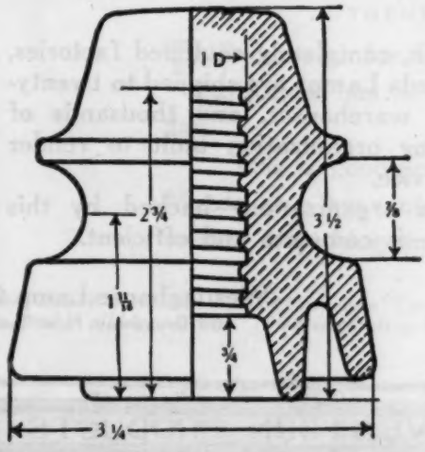

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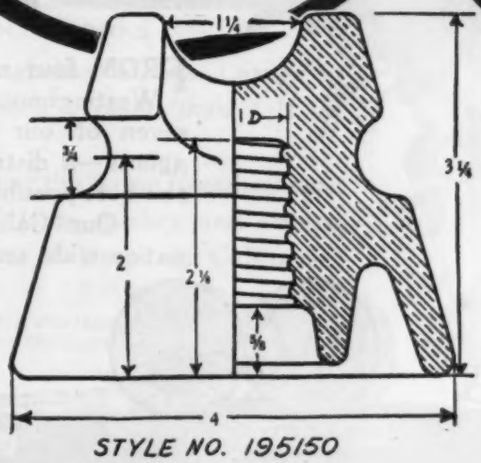


STYLE NO. 195150

Can Deliver From Stock 50,000 Pieces

Of any of these Porcelain Pin-Type Insulators—They are manufactured by the wet process, with the same careful workmanship, and from the same clays as used for our highest voltage porcelain insulators.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.
San Francisco Office, 1 Montgomery St.
Sole Agent in the United States for the
Pittsburgh High-Voltage Insulator Company
832

W
WESTINGHOUSE ELECTRIC

Fully described on Pages 118, 121, 122, 123, 124, and 129 of our New Catalogue No. 6-A

Westinghouse M

FROM four modern, completely equipped factories, Westinghouse Mazda Lamps are shipped to twenty-seven of our own warehouses, and thousands of agents—a distributing organization built to render the best possible service.

Our California organization—backed by this nation-wide service—is complete and efficient.

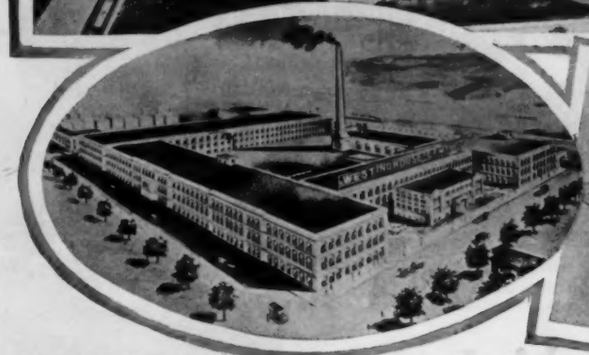
Westinghouse Lamp Company
165 Broadway, New York, N. Y.

GUARANTEED BY THE NAME

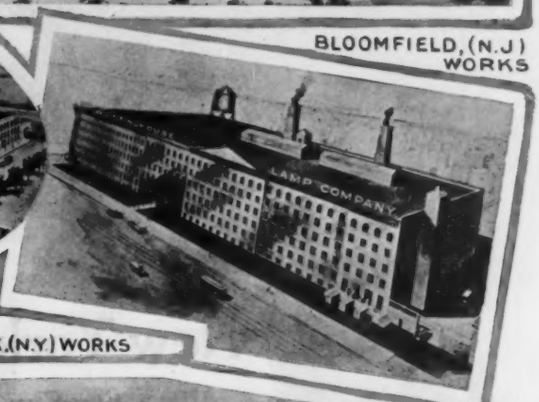
WESTERN PRODUCTS

EASTERN PRODUCTS

Mazda Lamps

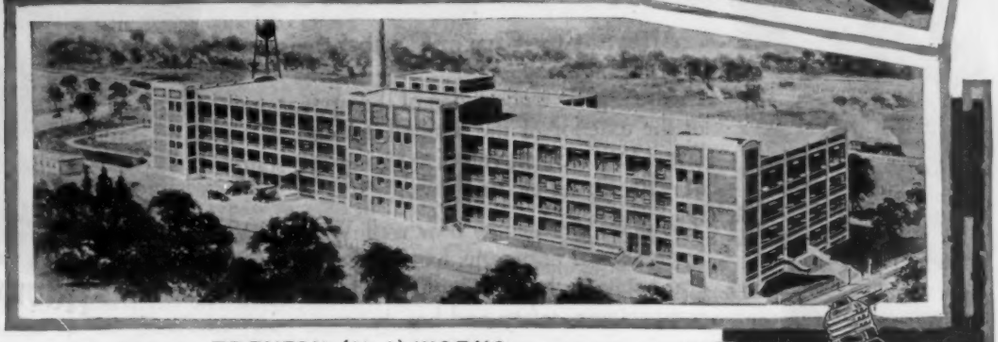


BLOOMFIELD, (N.J.) WORKS



MILWAUKEE, (WIS.) WORKS.

NEW YORK, (N.Y.) WORKS

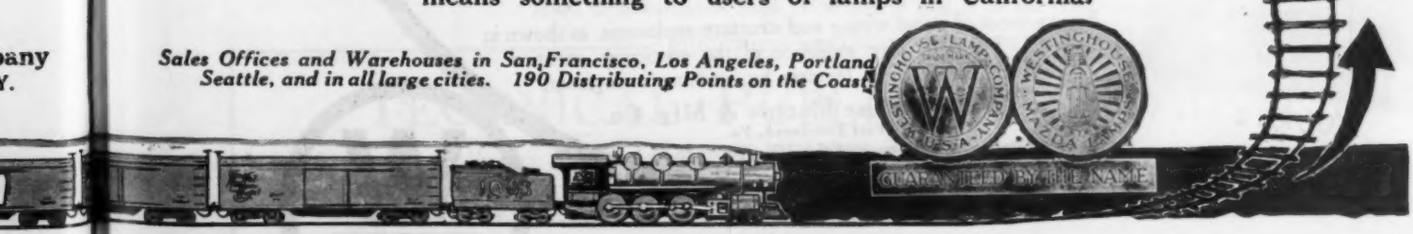


TRENTON, (N.J.) WORKS

THE demand for Westinghouse Mazda Lamps in California has never been greater than it is to-day.

This is good proof that the name Westinghouse Mazda as a guarantee of lamp quality and service means something to users of lamps in California.

Sales Offices and Warehouses in San Francisco, Los Angeles, Portland, Seattle, and in all large cities. 190 Distributing Points on the Coast.



Westinghouse

Switchboards and Switch Gear

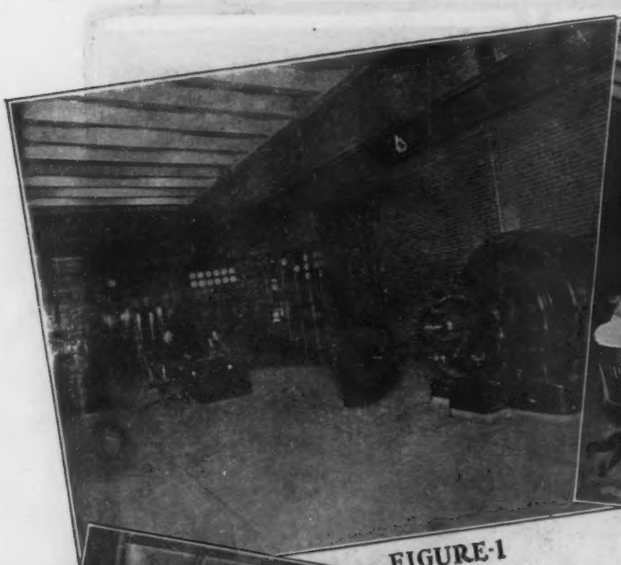


FIGURE-1

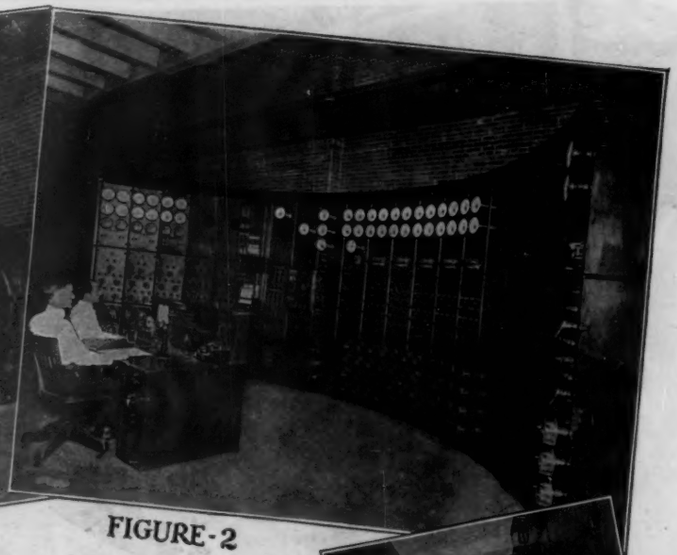


FIGURE-2

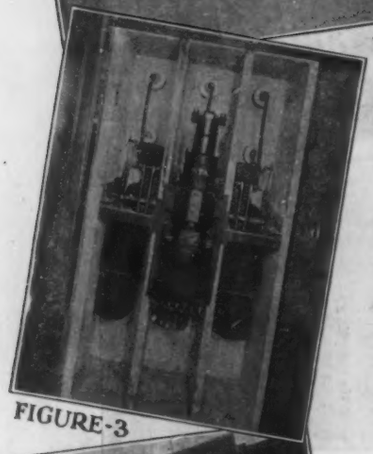


FIGURE-3

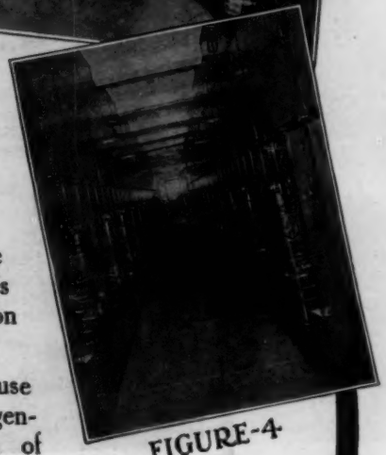


FIGURE-4

FIGURE-5

New York's Latest

Alternating-Current Sub-Station

Figure 5 gives a good idea of the appearance of the exterior of the United Electric Co.'s latest 7500/3000 volt distributing sub-station at 45th Street off Broadway.

The other views show how well Westinghouse Switchboard apparatus has fitted into the general station layout with its basic idea of compactness, safety and beauty.

Westinghouse Switchboard engineers in collaboration with Mr. W. E. McCoy, the customer's electrical engineer, developed the special "C-1" oil breakers for incoming 7500 volt lines, and special "E-10" breakers for 3000 volt distribution.

These permitted what is undoubtedly the most compact arrangement of switching equipment, evolved to date, for power, and number of feeders controlled, and absolutely essential due to real estate values in this dense metropolitan district.

Arrangement of panel wiring and structure enclosures, as shown in figures 1, 3 and 4, give evidence of the particular attention paid to "Safety First" features by customer's engineer.

Westinghouse Electric & Mfg. Co.

East Pittsburgh, Pa.

San Francisco Office, 1 Montgomery St.

829

W

WESTINGHOUSE ELECTRIC

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate Editor

VOLUME XXXIX — SAN FRANCISCO, NOVEMBER 1, 1917 — NUMBER 9

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ON LIBRARY CARS OF ALL SOUTHERN PACIFIC TRAINS

TERMS OF SUBSCRIPTION: United States, Cuba and Mexico $2.50 per year; Dominion of Canada $3.50 per year; Other Foreign Countries within the Postal Union $5.00 per year; Single Copies, current month 25c each. No volumes or copies available for sale more than one year back.

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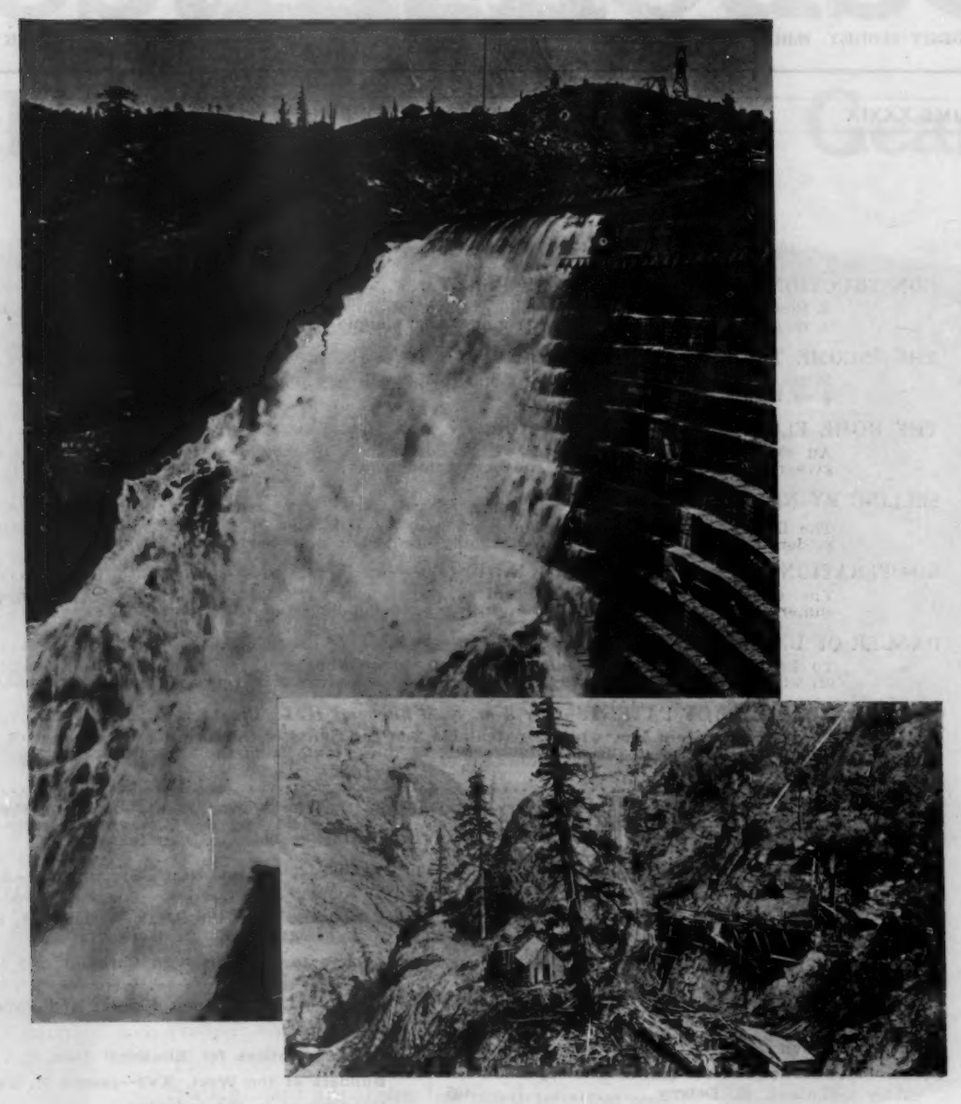
PUBLISHED SEMI-MONTHLY BY THE

TECHNICAL PUBLISHING COMPANY

CROSSLEY BUILDING, SAN FRANCISCO

EDWARD B. STRONG, President — WILLIS M. DEMING, V. P. and Business Manager — ROBERT SIBLEY, Secretary — EDWARD B. STRONG, Jr., Treasurer — ARTHUR H. HALLORAN, Assistant Business Manager

HOW THE WEST IS HELPING TO WIN THE WAR—I.



THE GIANT SPAULDING DAM AND ITS NEW POWER DEVELOPMENT

Immediately below the great Spaulding Dam of the Pacific Gas and Electric Company is being erected in an enclosure, hewn from solid granite, a unique power plant that will recover the power of the stored waters latent in the variable head of water supply in this mammoth reservoir. This unique instance of constructive genius of this well-known company—the greatest of hydroelectric institutions in the world—is typical of that splendid spirit of patriotic fervor that pervades the leaders and the rank and file of the electrical industry. In thus supplying gigantic energies for the turning of the wheels of industry, now loaded to the breaking point throughout the West, a decidedly helpful factor is added to the nation's ability to win the war.

Universal Electrical Holiday Gifts

Make a Merry Profit for every

UNIVERSAL

Dealer

UNIVERSAL
Electric
Immersion
Heater
No. E976

UNIVERSAL
Electric
Curling
Iron
No. E9991

UNIVERSAL
Electric Heating Pad
No. E9940

The Christmas rush for UNIVERSAL Home Needs is on.

The unprecedented demand for these goods makes it difficult to insure prompt shipments.

The congested condition of the railroads makes it slow to get the goods to you.

If you want to get in on this unheard of Christmas demand for UNIVERSAL products, ORDER NOW for delivery before Christmas.

UNIVERSAL
Electric Iron
No. E9021

UNIVERSAL
Electric Toaster
No. E946

Landers, Frary & Clark

New Britain, Connecticut

UNIVERSAL
Aluminum Electric
Coffee Percolator
No. E9676

UNIVERSAL
Electric Chafing Dish
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Cleats, Porcelain
B-1, P-2, T-1, W-2.

Climbers
B-1, P-2, W-2.

Clusters
B-2, F-1, P-2, W-2.

Coils, Armature, Field
C-3, G-1, W-2, W-4.

Coils, Induction and Spark
P-2, W-2, W-4.

Coils, Choke
G-1, W-2, W-4.

Condensers, Steam
M-3, W-4.

Conduits
C-5, P-2, W-2.

Compounds, Insulating and Splicing
B-1, P-2, S-6, W-2, W-4.

Concentric Wiring Fittings
G-1, W-2.

Conduit Fittings
A-4, B-1, E-3, P-2, S-5, V-1, W-2.

Conduit, Flexible and Rigid
A-4, B-1, P-2, S-5, T-2, W-2, Y-1.

Conduit, Underground
P-2, P-5, W-2.

Controllers, Motor
C-3, C-4, E-6, G-1, G-3, W-1, W-2, W-3, W-4.

Contactors, A.C. and D.C.
C-4, E-6, G-1, G-3, W-4.

Cooking Utensils, Electric
A-3, C-4, E-5, F-3, H-5, G-1, L-1, P-2, W-2, W-4.

Cord, Flexible Bell
P-2, W-2.

Cord, Lamp
B-1, G-1, P-2, W-2, Y-1.

Cord, Telephone
B-1, P-2, W-2.

Cut-Outs
G-1, P-2, W-2, W-3, W-4.

Dimmers, Theater
C-4, G-1, P-2, W-2, W-3.

Dynamos, A.C.
C-3, G-1, G-3, W-1, W-4.

Dynamos, D.C.
C-3, G-1, P-3, W-4.

Engines, Gas and Gasoline
W-4.

Engines, Steam
M-3, W-4.

Fans, A.C., Portable
C-1, C-3, E-5, F-3, G-1, G-3, P-2, P-3, S-5, W-2, W-4.

Fans, D.C., Portable
C-3, E-5, G-1, G-3, P-2, P-3, S-5, W-2, W-4.

Fans, A.C., Ceiling
C-1, G-1, P-2, P-2, S-5, W-2, W-4.

Fans, D.C., Ceiling
G-1, P-2, P-3, S-5, W-2, W-4.

Fans, Exhaust
C-3, G-1, M-3, P-2, W-2, W-4.

Feed Water Heaters
M-3.

Fibre
B-1, P-2.

Filters, Oil
M-3.

Fixtures
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Fixture Parts
B-2, F-1, V-1 W-2.

Flash Lights, Electric
A-1, F-3, N-6, P-2, W-2.

Flood Light Projectors
C-5, G-1.

Furnaces, Electric
G-1, W-2.

Fuse Boxes
B-1, D-1, P-2, V-1, W-2, W-4.

Fuse, Wire and Links
B-1, G-1, P-2, P-5, W-2.

Fuses, High Tension
B-1, G-1, P-2, W-4.

Fuses, Miscellaneous
B-1, G-1, F-3, P-2, W-2, W-4.

Fuses, Telephone
P-2, W-2.

Glassware, Shades and Globes
H-4, P-2, W-2.

Governors, Water-Wheel
P-5.

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B-2, P-2, W-2.

Hand Starters, A.C. & D.C.
C-4, E-6, G-1, W-1, W-2, W-3, W-4.

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G-1, H-4, P-2, W-4.

Hangers, Cable
B-1, G-1, H-4, P-2, S-6, W-2.

Hangers, Conduit
P-2, W-2.

Hangers, Fixture
F-1, H-4, P-2, W-2.

Hardware, Pole Line
B-1, H-4, P-2, P-5, T-1, W-2, W-4.

Headlights, Electric
C-5, G-1.

Heating Appliances, Including Irons, Stoves, Etc. (Electric)
A-3, C-4, E-5, F-3, H-5, L-1, P-2, W-2, W-4.

Hoists, Electric
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Hoods, Street
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B-1, G-1, H-2, P-2, P-5, W-2.

Insulators, High-Tension
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E-3.

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N-1.

Magnets, Lifting
C-4, E-6.

Meters, Ammeter and Volt
A-1, G-1, N-6, W-2, W-4.

Meters, Watthour
G-1, S-3, W-2, W-4.

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A-4, W-2.

Molding, Wood
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G-1.

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A-1, W-2.

Oil Burners and Systems
A-2, M-3.

Ozonators
P-2, S-5.

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B-1, P-2, W-4.

Paints, Preservative
B-1, N-1, P-2.

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D-2.

Panel Boards
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P-5, W-8.

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P-7, W-8.

Pipe, Welded Steel
P-5.

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P-7.

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Plugs, Stage
G-1, P-2, W-2.

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B-1, H-4, P-2, P-5, T-1, W-2, W-4.

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B-1, P-2, W-2.

Poles, Wood
B-1, P-2, W-2.

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T-1.

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F-1, P-2, W-2.

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M-3, P-7.

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Pumps, Condenser
W-4.

Pumps, Centrifugal
M-3, W-4.

Push Buttons
B-2, G-1, P-2, W-2.

Radiators, Electric
C-4, H-5, G-1, P-2, W-2, W-4.

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G-1, W-4.

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Rectifiers
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M-3.

Regulators, Voltage
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S-6.

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D-2.
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W-2.
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W-8.
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P-2, W-2.
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S-6.
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A-4, T-2.
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G-1, W-4.
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P-7.
Vacuum Cleaners, Electric
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Wire, Bare Copper
B-1, G-1, N-2, P-2, P-4, S-6, W-2.
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S-6.
Wire, Enameled
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Wire, Telephone
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Wire, Weatherproof
B-1, G-1, N-4, O-1, P-2, S-6, W-2.
Wireless Apparatus
B-1, P-2.

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The extra quality is more than worth the extra cost. Increased annual sales for over a quarter century shows others have found it so.
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We carry in our San Francisco stock room a complete stock of Victor Porcelain Insulators (both pin, suspension and strain), Insulator Pins, Clamps, etc., also complete line of Orangeburg Socket Joint Conduit, with all fittings, Governor Oil, Crossarms, etc.

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Manufactured by Hubbard & Company
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Distributors for the Pacific Coast

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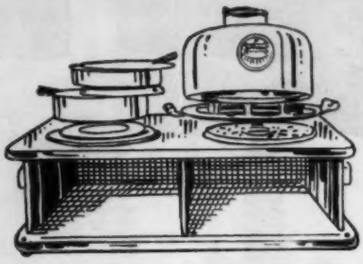
The Modern Electrical Supply House

LOS ANGELES OAKLAND PORTLAND SAN FRANCISCO SEATTLE SPOKANE

Hubbard Makes the Hardware



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tableware because the demand has already been created. It sells on sight.

Its unsurpassed beauty of design and efficiency in use make satisfied customers.

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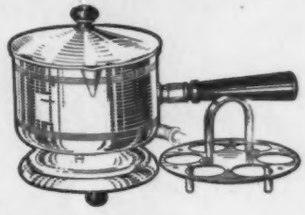

PACIFIC STATES ELECTRIC CO.

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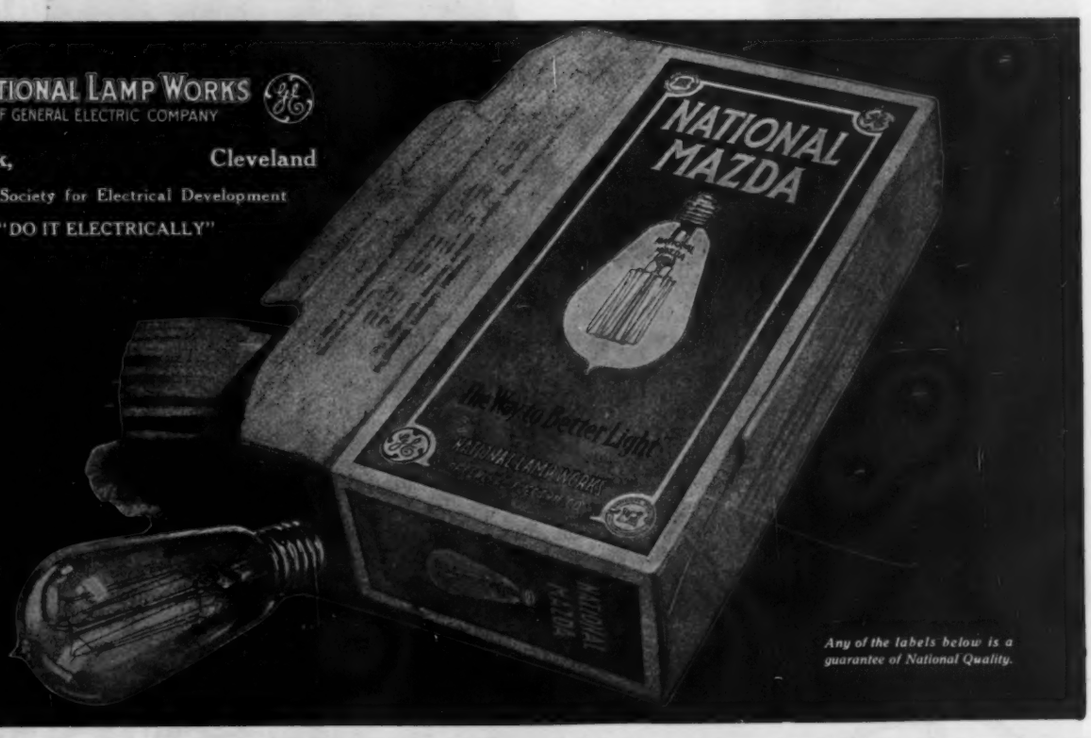
"DO IT ELECTRICALLY"



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RI Form C Single Phase Motors

Are Reversible

The illustration shows how easy it is to change the direction of rotation of any RI Single Phase Motor.

Just loosen a set screw, move the brush yoke and tighten the screw.

If reversible operation is desired, just wire up a four pole double throw switch. The motor can be reversed under full load without danger to the motor on the line. This motor is ideal for reversible machines, dumb-waiters, elevators, etc.

RI Form C Single Phase Motors

have no centrifugal switches or clutches. They deliver 2 to 2½ times normal torque at start and accelerate in 2 to 5 seconds.

RI Motors operate quietly and have no tendency to spark.

Will carry 50% overload for short periods.

Power factor and efficiency sustained at all loads.

Furnished in sizes ranging from ¼ to 20 H.P.—constant or variable speed. Are easily installed. Mechanical construction is simple, strong and durable.

Low starting and running current.

Fractional horse power sizes can be shipped from stock. Ask our nearest office.

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7235

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THE great majority—
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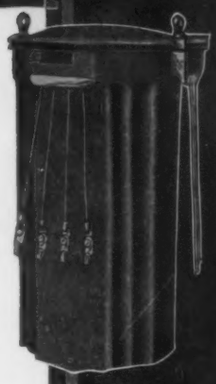

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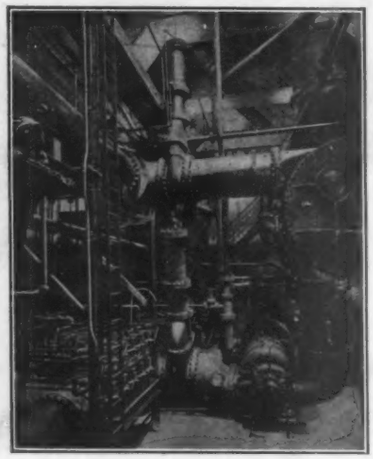

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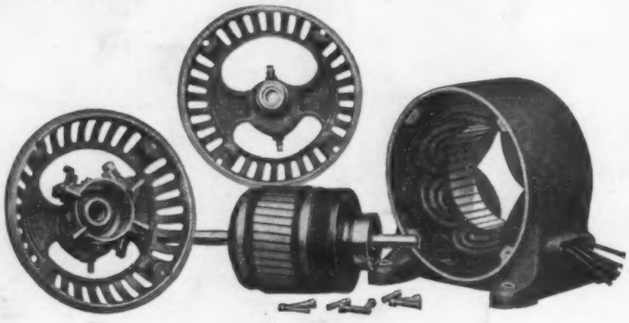

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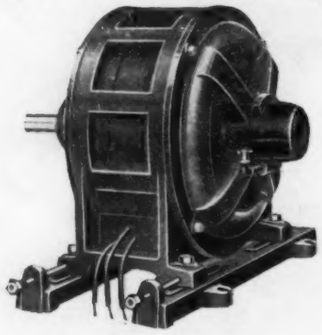
Fewer parts—greater strength and reliability.

Brushes mechanically lifted from commutator at full speed.

The Peerless Electric Co.
Warren, Ohio

HOWELL

POLYPHASE MOTORS



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Recentering bronze bearings.
40° rise at rated load.
25% overload capacity.

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